Portable
Series

For Use with CipherLab BASIC Compiler

BASIC Programming Guide

Version 3.05.16

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CIPHERLAB CO., LTD.
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Revision History

Version	Release Date	Notes
3.05.16	Apr. 10, 2007	◆ New: 5.21.2 Network Configuration – WPA-related parameters ◆ New: Appendix I – Symbology Parameter Table I: UPC-E1 Triple Check (Index No. 148)
3.05.15	Mar. 01, 2007	◆ New: 5.5.1 ON POWER_ON GOSUB ◆ New: 5.8 SR176 is supported ◆ Modified: 5.19.1 & 5.21.2 PPP LoginName[20] changed to LoginName[39] ◆ New: Appendix VI – Cradle commands
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3.05.07	Mar. 15, 2006	◆ Modified: Appendix I ~ V ◆ New: support Bluetooth HID on 8000
3.05	Feb. 21, 2006	◆ New: Customize Serial Number/Device ID

		◆ New: SYSTEM_INFORMATION$() ◆ Modified: CHANGE_SPEED for 711/8100/8000/8300 only ◆ Modified: LED() ◆ Modified: FUNCTION_TOGGLE() ◆ Modified: coordinate system of LCD ◆ Modified: SELECT_FONT() ◆ Modified: font files renamed for 8000/8300 ◆ Modified: port mapping ◆ Modified: SET_COM_TYPE() - 7 Acoustic/GSM_Modem ◆ Modified: SET_COM() with Acoustic Settings for 8000Modified: support 2 MB flash on 8000/8500 ◆ Modified: “PPP via IR” default baud rate for modem cradle is 57600 ◆ Modified: GSM read data format ◆ Modified: String limit 255 bytes instead of 250 bytes (4.1.1, 4.2.1, 5.21.1) ◆ New: READER_CONFIG() to support 2D, (Extra) Long Range Laser ◆ Modified: CODE_TYPE() ◆ Modified: READER_SETTING() ◆ Modified: LCD_CONTRAST() for 8500 ◆ Modified: LOCATE() ◆ Modified: RFID ◆ Modified: MENU()
3.04	Nov. 18, 2005	◆ Remove 720 ◆ New: Screenshots of Compiler's menus ◆ New: Code type GTIN (87) ◆ New: READER_SETTING index 86, 87 ◆ New: PPP via IR/RS-232 ◆ Modified: COM port mapping, GET_SCREENITEM, SET_COM, SET_NET_PARAMETER, START TCPIP ◆ Updated: indexing for Net Configuration and Net Status

Contents

CHAPTER 1

Introduction

The CipherLab BASIC Compiler provides users with a complete programming environment to develop application programs for the CipherLab terminals in the BASIC language. The Windows-based Basic Compiler comes with a menu-driven interface to simplify software development and code modifications. Many system configurations, such as COM port properties and database file settings can be set up in the menus. Using this powerful programming tool to get rid of lengthy coding, users can develop an application to meet their own needs efficiently.

This manual is meant to provide detailed information about how to use the BASIC Compiler to write application programs for the CipherLab portable terminals. It is organized in five chapters giving outlines as follows:

- Chapter 1 "Introduction" - gives a brief on this manual.
- Chapter 2 "Development Environment" - gives a concise introduction about the Basic Compiler, the development flow for applications, and the BASIC Compiler Run-time Engines.
- Chapter 3 "Using CipherLab BASIC Compiler" - gives a tour of the programming environment of the BASIC Compiler.
- Chapter 4 "Basics of CipherLab BASIC Language" - discusses the specific characteristics of the CipherLab BASIC Language.
- Chapter 5 "BASIC Commands" - discusses all the supported BASIC functions and statements. More than 200 BASIC functions and statements are categorized according to their functions, and discussed in details.

The CipherLab BASIC Compiler has been modified and improved since its first release in November 1997. Users can refer to RELEASE.TXT for detailed revision history.

CHAPTER 2

Development Environment

In This Chapter

2.1 Directory Structure

The CipherLab BASIC Compiler Kit contains two directories, namely, ***BC*** and ***DOWNLOAD***. The purposes and contents of each directory are listed below.

To set up the BASIC programming environment on your PC, simply copy these two directories from the CD-ROM to your local hard disk.

2.1.1 BC Directory

This directory contains the BASIC Compiler and the BASIC programs.

▪ BC.exe:	The BASIC Compiler program.
▪ BC.chm:	The on-line help file for the BASIC Compiler.
▪ Synload.exe:	The download program for downloading the Basic object files (.syn and .ini) to the CipherLab terminals.
▪ Release.txt:	The revision history of the BASIC compiler.
▪ Samples:	Include BASIC source files (.bas), initialization files (.ini) and BASIC object files (.syn) of the sample programs.

2.1.2 DOWNLOAD Directory

This directory contains download utilities, the BASIC Run-time Engines and font files.

- Download.exe: The download utility to download the Motorola S format object file (.shx) to the CipherLab terminals via RS-232 or standard IrDA port.

- IRLoad.exe: The download utility to download the Motorola S format object file (.shx) to the CipherLab terminals via Serial IR Transceiver.

- BASIC Run-time Engines:

BC711.shx BC8100.shx	// English version	System font
BC711-JP.shx BC8100-JP.shx	// Japanese version	Need to download font file
BC711-KR.shx BC8100-KR.shx	// Korean version	Need to download font file
BC711-RU.shx BC8100-RU.shx	// Russian version	Font included
BC711-SC.shx BC8100-SC.shx	// Simplified Chinese	Need to download font file
BC711-SD.shx BC8100-SD.shx	// Simplified Chinese	Need to download font file
BC711-TC.shx BC8100-TC.shx	// Traditional Chinese version	Need to download font file
BC8000.shx	// 8000 generic version	Need to download font file
BC8300.shx	// 8300 generic version	Need to download font file

- Font files

711, 8100 Series

Font-jp.shx	// Japanese	Font size: 16x16 (4 lines)
Font-kr.shx	// Korean	Font size: 16x16 (4 lines)
Font-sc.shx	// Simplified Chinese	Font size: 16x16 (4 lines)
Font-sd.shx	// Simplified Chinese	Font size: 12x12 (4 lines)
Font-tc.shx	// Traditional Chinese	Font size: 16x16 (4 lines)

8000, 8300 Series

Font_8x00_Hebrew.shx	Font size: 6x8 or 8x16
Font_8x00_Japanese.shx	Font size: 16x16 (4 lines)
Font_8x00_Japanese12.shx	Font size: 6x12 or 12x12 (5 lines)
Font_8x00_Korean.shx	Font size: 16x16 (4 lines)
Font_8x00_Korean12.shx	Font size: 6x12 or 12x12 (5 lines)
Font_8x00_Nordic.shx	Font size: 6x8 or 8x16
Font_8x00_Polish.shx	Font size: 6x8 or 8x16
Font_8x00_Russian.shx	Font size: 6x8 or 8x16
Font_8x00_SChinese.shx	Font size: 16x16 (4 lines)
Font_8x00_SChinese12.shx	Font size: 6x12 or 12x12 (5 lines)
Font_8x00_TChinese.shx	Font size: 16x16 (4 lines)
Font_8x00_TChinese12.shx	Font size: 6x12 or 12x12 (5 lines)
Font_8x00_Multi_Language.shx	Font size: 6x8 or 8x16

8500 Series

Font8500-Jp.shx	// Japanese	Font size: 16x16 (9 lines)
Font8500-Kr.shx	// Korean	Font size: 16x16 (9 lines)
Font8500-Sc.shx	// Simplified Chinese	Font size: 16x16 (9 lines)
Font8500-Sc12.shx	// Simplified Chinese	Font size: 6x12 or 12x12 (12 lines)
Font8500-Tc.shx	// Traditional Chinese	Font size: 16x16 (9 lines)
Font8500-Tc12.shx	// Traditional Chinese	Font size: 6x12 or 12x12 (12 lines)
Font8500-Multi-Language. shx	// Multilanguage	Font size: 6x8 or 8x16

2.2 System Requirements

Before you install the CipherLab BASIC Compiler, it is necessary to check that your PC meets the following minimum requirements:

Items	Requirements
CPU	Pentium 75MHz
Operating System	Windows 95/98/2000/NT/XP
Minimum RAM	16 MB
Minimum Hard Disk Space	20 MB

Note: Any terminal being programmed will need to have a minimum 128KB RAM.

2.3 BASIC Run-time Engine

The BASIC Run-time Engines work as interpreters of the BASIC commands. The CipherLab terminals have to be loaded with the BASIC Run-time Engines to run the BASIC programs. Each model of terminal has its own Run-time Engine to drive its specific hardware features. The Run-time Engines are named as "BCxxx.shx", where "BCxxx" is the model number of the target terminal. For example, "BC711.shx" is the BASIC Run-time for 711.

The BASIC Run-time also provides the capabilities for user to configure the terminal. With the Run-time Engine loaded, the terminal can be set to the "System Mode". In the "System Mode", user can set up the system settings such as the system clock and update the user program and so on. The System Menu presented in the "System Mode" varies for different models of terminals. For detailed functions of the System Menu, please refer to the user manual of the terminal.

Note: The System Menu is launched by pressing three keys simultaneously: [7], [9], and the POWER key

2.4 Development Flow

Developing a BASIC program for the CipherLab terminal is as simple as counting 1-2-3. There are three steps:

Step 1 - Download the BASIC Run-time to the target terminal.

Step 2 - Edit and compile the BASIC program.

Step 3 - Download the BASIC object file to the target terminal.

2.4.1 Download Run-time Engine

The BASIC Run-time Engines are programs being loaded on the CipherLab terminals to execute the BASIC object files. They must exist in the terminals before the BASIC object files are downloaded. To download the Run-time Engine (and/ or any other programs), the target terminal needs to be set to the "Download Mode" first to receive the new program. There are two ways to enter the "Download Mode": one is from the System Menu, and the other is from the Kernel Menu. For details of how to download a program, please refer to the terminal's user manual.

Note: After the battery pack is re-installed, the Kernel Menu can be launched by pressing three keys simultaneously: [1], [7], and the POWER key

After the target terminal is set to the "Download Mode" and the connection to the host PC is properly established, user can run one of the programs on the host PC to download the BASIC Run-time or any other ***.shx*** files to the terminal:

▪ Download.exe	(for RS-232/IrDA interface)
▪ IRLoad.exe	(for Cradle-IR interface)
▪ ProgLoad.exe	(for RS-232/IrDA, Cradle-IR or TCP/IP)

After the Run-time Engine is downloaded successfully, the message "Ready for BASIC Download" will be shown on the display of the terminal.

2.4.2 Edit and Compile the BASIC Program

The BASIC Compiler, ***bc.exe***, comes with a text editor where users can edit their BASIC programs. Please refer to the next chapter for general information of the operation.

By default, the text being edited with the editor would be saved as a BASIC source file (***.bas***). The system settings defined in the Configuration Menu, including "Target Machine", COM port settings, transaction file settings, DBF settings and barcode settings, would be saved as a system initialization file (***.ini***) with the same name when the ***.bas*** file is saved. The ***.ini*** file should be treated as part of the BASIC program, and should be included when the BASIC program is distributed.

If the BASIC program compiles without any errors, a BASIC object file (***.syn***) with the same name is generated. The ***.ini*** file and the ***.syn*** file are the two files to be downloaded to the terminal. The ***.ini*** file contains the system settings, while the ***.syn*** file contains the BASIC object code.

2.4.3 Download the BASIC Object Files

Use the BASIC Compiler or the standalone BASIC download utility, ***Synload.exe***, to download a compiled BASIC program. ***Synload.exe*** provides only the download function of the BASIC Compiler, that is, it cannot be used to view or edit any BASIC code.

Both the ***.ini*** and ***.syn*** files must be downloaded to the target terminal. Be careful that if the ***.ini*** file is missing, the BASIC Compiler will download the default settings instead. In this case, it may cause errors during execution. In contrast to the BASIC Compiler, ***Synload.exe*** will not process the downloading if the ***.ini*** file is missing, and an error message will be shown on the display.

After the BASIC object file is downloaded, the target terminal will reboot itself to execute the BASIC program. If any run-time error occurs, an error message will be shown on the display. Please refer to Appendix II for a list of run-time errors. If the program is not running as desired, modify the BASIC source code and download it to the target terminal again.

CHAPTER 3

Using CipherLab BASIC Compiler

The CipherLab BASIC Compiler looks like a traditional Windows environment application that supports file management, text editing, and some other functions to simplify the BASIC program development. There are five menus on the menu bar, and each menu provides several commands/items.

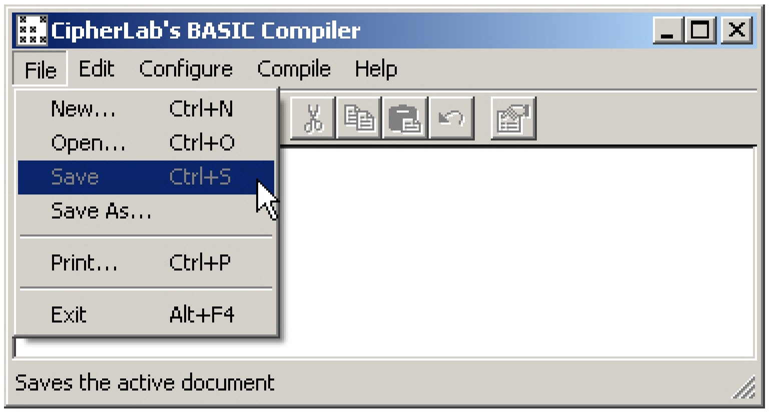
- File Menu
- Edit Menu
- Configure Menu
- Compile Menu
- Help Menu

This chapter discusses the function and operation of each command/item.

In This Chapter

3.1 File Menu

Six commands are provided on this menu.


CipherLab's BASIC Compiler
File Edit Configure Compile Help
New... Ctrl+N
Open... Ctrl+O
Save Ctrl+S
Save As...
Print... Ctrl+P
Exit Alt+F4
Saves the active document

Command	To Do...	
New	◆ Function	To create a new BASIC program.
	◆ Operation	Click "File" on the menu bar and select "New". For the same function, press hot key CTRL+ N or click the [New] icon on the tool bar.
Open	◆ Function	To open an existing BASIC program.
	◆ Operation	Click "File" on the menu bar and select "Open". For the same function, press hot key CTRL+ O or click the [Open] icon on the tool bar.
Save	◆ Function	To save the current editing BASIC program.
	◆ Operation	Click "File" on the menu bar and select "Save". For the same function, press hot key CTRL+ S or click the [Save] icon on the tool bar.
Save As	◆ Function	To save the current editing BASIC program with a new name.
	◆ Operation	Click "File" on the menu bar and select "Save As". Enter a new name in the pop-up window. Then click the [Save] button to save this program with the new file name.

Print

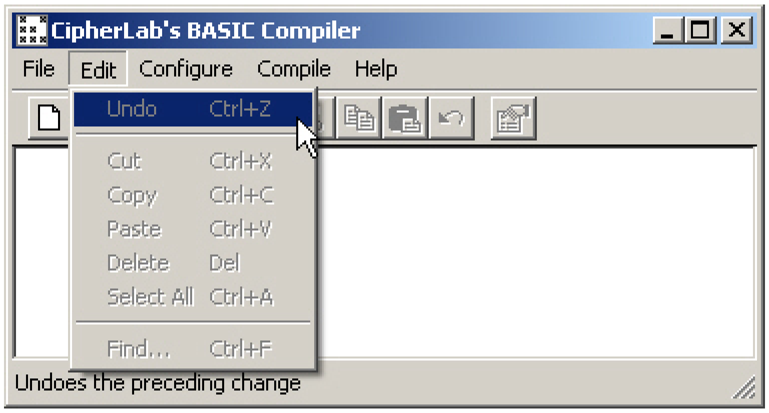
◆ Function	To print the current editing BASIC program.
◆ Operation	Click "File" on the menu bar and select "Print". For the same function, press hot key CTRL+ P or click the [Print] icon on the tool bar.

Exit

◆ Function	To quit the BASIC Compiler.
◆ Operation	Click "File" on the menu bar and select "Exit". For the same function, press hot key ALT+ F4.

3.2 Edit Menu

Seven commands are provided here to facilitate the editing of the BASIC source code.



Undoes the preceding change

Command	To Do...	
Undo	◆ Function	To abort the previous editing command or action.
	◆ Operation	Click "Edit" on the menu bar and select "Undo". For the same function, press hot key CTRL+ Z or click the [Undo] icon on the tool bar.
Cut	◆ Function	To cut a paragraph off the text and place it on the clipboard. The paragraph will be removed.
	◆ Operation	Drag the cursor to select the paragraph to be cut off. This paragraph will be highlighted (in a reverse color). Click "Edit" on the menu bar and select "Cut". For the same function, press hot key CTRL+ X or click the [Cut] icon on the tool bar.
Copy	◆ Function	To copy a paragraph from the text to the clipboard.
	◆ Operation	Drag the cursor to select the paragraph to be copied. This paragraph will be highlighted (in a reverse color). Click "Edit" on the menu bar and select "Copy". For the same function, press hot key CTRL+ C or click the [Copy] icon on the tool bar.

Paste

- Function: To paste a paragraph from the clipboard into the text. This paragraph will be inserted to the text.
- Operation: Move the cursor to the insertion point where the paragraph will be inserted, and left-click the mouse. Click "Edit" on the menu bar and select "Paste".

  For the same function, press hot key CTRL+ V or click the [Paste] icon on the tool bar.

Delete

- Function: To delete a paragraph from the text. This paragraph will not be placed on the clipboard.
- Operation: Drag the cursor to select the paragraph to be deleted. This paragraph will be highlighted (in a reverse color). Click "Edit" on the menu bar and select "Delete".

  For the same function, press the Del key.

Select All

- Function: To select all the contents of the text.
- Operation: Click "Edit" on the menu bar and select "Select All". All the contents will be highlighted (in a reverse color).

  For the same function, press hot key CTRL+ A.

Find

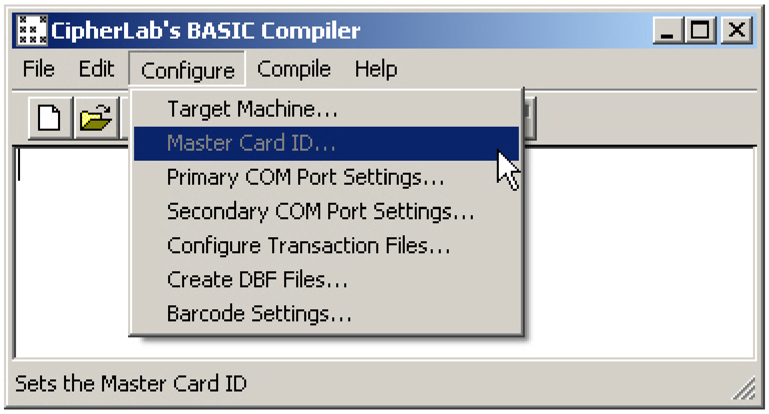
- Function: To find a specific letter, symbol, word, or paragraph in the text.
- Operation: Click "Edit" on the menu bar and select "Find". In the pop-up window, enter the key word to be found in the text. Then, click the [Find] button to start searching.

  For the same function, press hot key CTRL+ F or click the [Find] icon on the tool bar.

3.3 Configure Menu

Seven items are provided here for user to define the system settings.

The "Configure Transaction Files" and "Create DBF Files" items provide the option of "Share file space with other applications". The 8000/8300/8500 series terminals support multiple applications, but only one of them is active; this setting option allows different applications share the same files.



Command	To Do...	
Target Machine	◆ Function	To set the type of the target machine.
	◆ Operation	Click "Configure" on the menu bar and select "Target Machine". Then scroll through the drop-down menu in the pop-up window to set the target machine. The selection of the target machine will affect the number of transaction files, the available baud rate of the COM port.
Master Card ID	◆ Function	To define the ID of the master setup card.
	◆ Operation	Click "Configure" on the menu bar and select "Master Card ID". Type the new card ID in the field in the pop-up window. (This feature is only valid for stationary terminals, such as models 201/510/520.)
Primary COM Port Setting	◆ Function	To set the properties of the primary COM port.
	◆ Operation	Click "Configure" on the menu bar and select "Primary COM Port Setting". Select the desired settings for each property in the pop-up window.

Secondary COM Port Setting

- Function — To set the properties of the secondary COM port.
- Operation — Click "Configure" on the menu bar and select "Secondary COM Port Setting". Select the desired settings for each property in the pop-up window.

Configure Transaction Files

- Function — To define the transaction files (up to 6) to be used and the data length for each transaction file.

  Once the data length is defined, the system will reserve space for the program. If the space is larger than needed, it would be a waste. On the other hand, when space is insufficient, data will be truncated to fit in.

  “Share file space with other applications” is enabled by default, which means the same transaction file will not be deleted after new program is downloaded. If disabled, user can get larger file system size.
- Operation — Click "Configure" on the menu bar and select "Configure Transaction Files". In the pop-up window, check the box to enable the use of a transaction file, and type the data length for each enabled transaction file.

Create DBF Files

- Function — To define the DBF files (up to 5) to be used and the IDX files for each DBF file.
- Operation — Click "Configure" on the menu bar and select "Create DBF Files". In the pop-up window, type the total record length for each DBF file and define the offset and length for the IDX files.

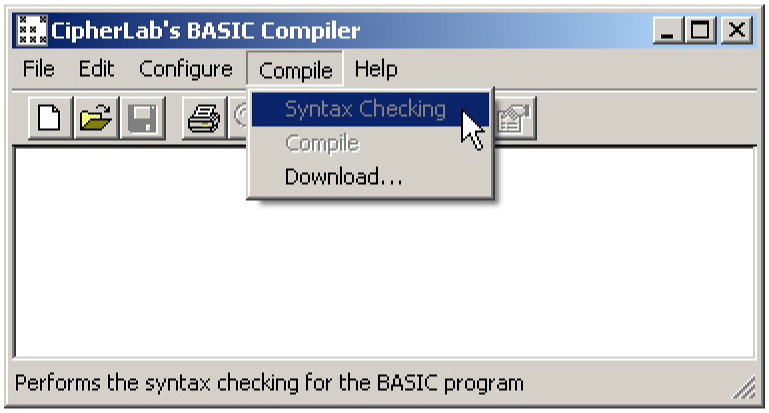
Barcode Setting

- Function — To configure the system parameters for barcode symbologies and scanner performance.
- Operation — Click "Configure" on the menu bar and select "Barcode Setting". In the pop-up window, check the box to enable the decodability of the target terminal for a particular barcode symbology. For the description of each barcode setting, please refer to Appendix I.

Note: When exiting the BASIC Compiler or opening another file, if the current file has not been changed but the barcode settings have been changed, user will be asked whether to save the current file or not.

3.4 Compile Menu

Three commands are provided on this menu.



Performs the syntax checking for the BASIC program

Command	To Do...	
Syntax checking	◆ Function	To check the syntax of the BASIC program.
	◆ Operation	Click "Compile" on the menu bar and select "Syntax checking". In the case of any syntax error in the BASIC program, the "Output" window pops up to show the line numbers and display the relevant syntax error message.
Compile	◆ Function	To compile the BASIC program.
	◆ Operation	Click "Compile" on the menu bar and select "Compile". For the same function, click the "Compile" icon on the tool bar. In the case of any syntax or compiling error, the "Output" window pops up to display the error messages. If the compilation is successfully done, the message "Build successfully, do you want to download the program?" will be shown on the screen. Click the [Yes] button if you want to download the program. (Refer to the "Download" command for downloading operation.)

Download

- Function

  To download a compiled BASIC program to the target terminal.

- Operation

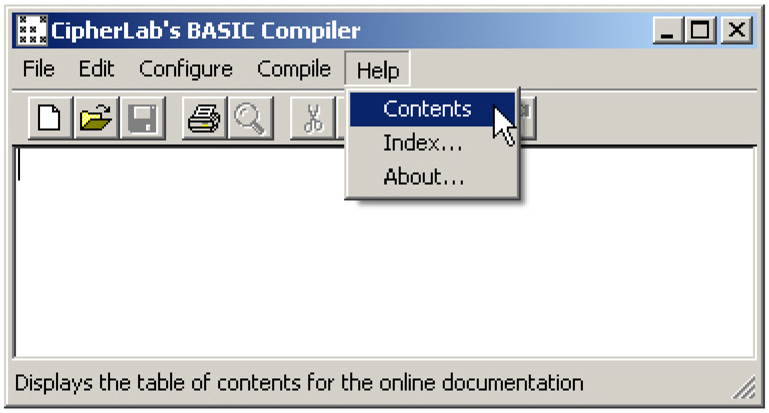
  Click "Compile" on the menu bar and select "Download". In the pop-up window, select the BASIC object file (.syn) to be downloaded, and then click [Open]. Select the correct COM port properties and then click [OK] to download.

  (For 711, user may select to download the BASIC program via Serial IR transceiver.)

  Note that the associated system initialization file (.ini) has to be in the same directory as the BASIC object file is; otherwise, the default system settings will be downloaded instead.

3.5 Help Menu

Three commands are provided on this menu.



Displays the table of contents for the online documentation

Command	To Do...	
Contents	◆ Function	To display a table of contents for the BASIC online documentation.
	◆ Operation	Click "Help" on the menu bar and select "Contents". The online help file will be opened. Click on any topic for more detailed information.
Index	◆ Function	To display the help file index.
	◆ Operation	Click "Help" on the menu bar and select "Index". The online help file will be opened. Type a string for searching or directly click on the listed index entry for viewing further information.
About	◆ Function	To display the ownership and version of the program. Note that the version information is necessary when tracing a programming problem.
	◆ Operation	Click "Help" on the menu bar and select "About". The pop-up message box declares the ownership and version information of the program.

CHAPTER 4

Basics of the CipherLab BASIC Language

In This Chapter

4.1 Constants

Constants are the actual values that BASIC uses during execution. There are two types of constants:

- String
- Numeric

4.1.1 String

A string constant is a sequence of up to 255 alphanumeric characters or symbols enclosed in a pair of double quotation marks.

- "Hello"
- "$20,000.00"
- "12 students"

4.1.2 Numeric

Numeric constants include positive and negative numbers. Numeric constants in BASIC cannot contain commas. There are three types of numeric constants that can be used in the CipherLab BASIC Compiler:

▪ Integer Constants:	Whole numbers between - 32,768 and + 32,767. No decimal point.
▪ Real Number Constants:	Positive or negative real numbers, that is, numbers that contain a decimal point, such as 5.34 or - 10.0.
▪ Long Integer Constants:	Whole numbers between - 2,147,483,648 and + 2,147,483,647.

4.2 Variables

Variables are symbols used to represent data items, such as numerical values or character strings that are used in a BASIC program. The value of a variable may be assigned explicitly and can be changed during the execution of a program. Be aware that the value of a variable is assumed to be undefined until a value is assigned to it.

4.2.1 Variable Names and Declaration Characters

The following are the rules for variable names and declaration characters:

- A variable name must begin with a letter (A to Z).
- The remaining characters can be letters, numbers, and/or underscores.
- The last character can be one of these type declaration characters:

`% integer`	: 2 bytes	(- 32,768 to + 32,767)
`& long`	: 4 bytes	(- 2,147,483,648 to + 2,147,483,647)
`! real number`	: 4 bytes	
`$ string`	: 255 bytes	
`nothing (default)`	: 2 bytes	(- 32,768 to + 32,767)

- The variable name cannot be a BASIC reserved word.
- Only 4 types of variables are supported. The maximum number of variables is 1,000.
- Variable names are not case-sensitive.

4.2.2 Array Variables

An array is a group or table of values referenced by the same variable name.

Each element in an array is referenced by an array variable that is subscripted with an integer or an integer expression.

- An array variable name has as many dimensions as there are subscripts in the array. For example,

`A(12)`	: would reference a value in a one-dimension array.
`T(2,5)`	: would reference a value in a two-dimension array.
	... and so on.

- Each element in an array is referenced by an array variable that is subscripted with an integer or an integer expression. For example,

`DIM IntegerA%(20)`	: declares an integer array with 20 elements.
`DIM StringB$(100)`	: declares a string array with 100 elements.
`DIM RealC!(10)`	: declares an integer array with 10 elements.
`DIM Tb(5,5)`	: declares a two-dimension integer array with 5x5 elements.
`ArrayD(i+1,j)`	: The elements of an array are subscripted with an integer expression.

- The first element of an array is subscripted with 1.
- In the CipherLab BASIC language, the maximum number of dimensions for an array is 2, and, up to 32,767 elements per dimension is allowed while compiling.

4.3 Expression and Operators

An expression may be a string or numeric constant, or a variable, or it may be a combination of constants and variables with operators to produce a single value.

Operators perform mathematical or logical operations. The operators provided by the CipherLab BASIC Compiler may be divided into four categories, namely, ***Assignment Operator***, ***Arithmetic Operators***, ***Relational Operators***, and ***Logical Operators***.

4.3.1 Assignment Operator

The CipherLab BASIC Compiler supports an assignment operator: "=".

For example,

- Length% = 100
- PI! = 3.14159
- Company$ = "CipherLab Co., Ltd."

4.3.2 Arithmetic Operator

The arithmetic operators are:

Operator	Operation	Sample Expression
^	Exponentiation	A% = 9^3
-	Negation (unary)	A% = -B%
*	Multiplication	A! = B! * C!
\	Division (integer)	A% = B! \ C!
/	Division (real)	A! = B! / C!
+	Addition	A% = B% + C%
-	Subtraction	A% = B% - C%
MOD	Modulo arithmetic	A% = B% MOD C%

4.3.3 Relational Operator

Relational operators are used to compare two values. The result of the comparison is either "True" or "False". This result may then be used to make a decision regarding program flow.

Operator	Operation	Sample Expression
=	Equality	A% = B%
<>	Inequality	A% <> B%
><	Inequality	A! >< B!
>	Greater than	A% > B!
<	Less than	A! < B!
>=	Greater than or equal to	A% >= B%
<=	Less than or equal to	A% <= B%

4.3.4 Logical Operator

Logical operators perform tests on multiple relations and Boolean operations. The logical operator returns a bit-wise result which is either "True" (not zero) or "False" (zero). In an expression, logical operations are performed after arithmetic and relational operations.

Operator	Operation	Sample Expression
NOT	Logical negation	IF NOT (A% = B%)
AND	Logical and	IF (A% = B%) AND (C% = D%)
OR	Inclusive or	IF (A% = B%) OR (C% = D%)
XOR	Exclusive or	IF (A% = B%) XOR (C% = D%)

4.4 Operator Precedence

The precedence of BASIC operators affects the evaluation of operands in expressions. Expressions with higher precedence operators are evaluated first. The precedence of BASIC operators is listed below in the order of precedence from highest to lowest. Where several operators appear together, they have equal precedence.

Order of Precedence	Type of Operation	Symbol
Highest	Arithmetic - Exponentiation	^
↓	Arithmetic - Multiplication, Division, Modulo	*, \, /, MOD
↓	Arithmetic - Addition, Subtraction	+, -
↓	Relational	=, <>, >, <, >=, <=
↓	Logical	AND, NOT, OR, XOR
Lowest	Assignment	=

4.5 Labels

Line labels are used to represent some special lines in the BASIC program. They can be either integer numbers or character strings.

- A valid integer number for the line label is in the range of 1 to 32,767.
- A character string label can have up to 49 characters. (If the string label has more than 49 characters, it will be truncated to 49 characters long.)
- The maximum number of labels is 1,000.

Note: The maximum compilable lines are 12,000. (trial version: 1,000 lines)

A character string label that precedes a program line must have a colon ":" between the label and the program line, but it is not necessary for an integer label. For example,

```
      GOTO 100

      ...

100         PRINT "This is an integer label."

      ...

      GOTO Label2

      ...

Label2:     PRINT "This is a character string label."
```

4.6 Subroutines

A subroutine is a set of instructions given a particular name or a line label. Users can simplify their programming by breaking programs into smaller logical subroutines. A subroutine will be executed when being called by a **GOSUB** command. For example,

```
      ON KEY(1)GOSUB KeyF1

      ...

KeyF1:

      PRINT "F1 is pressed."
      RETURN
```

The command **RETURN** marks the end of the subroutine and tells the processor to return to the caller. A subroutine has to be appended at the end of the main BASIC program.

A subroutine can be defined with or without a pair of brackets. For example,

```
SUB Subroutine1( )

      ...

      PRINT "Subroutine1 is executed."

      END SUB

      ...

SUB Subroutine2

      ...

      PRINT "Subroutine2 is executed."

      END SUB
```

Since all the variables in the CipherLab BASIC program are treated as global variables, passing arguments to subroutines is meaningless and enclosing arguments in the brackets of the subroutines will lead to a syntax error while compiling.

A subroutine in BASIC can be recursive, which means it can call itself or other subroutines that in turn call the first subroutine. The following sample program contains a recursive subroutine - Factorial, to calculate the value of n! ("n factorial").

```
      PRINT "Please enter a number (1 - 13):"
      INPUT N%
      FactResult! = 1
      Fact% = N%
      GOSUB Factorial
      PRINT N%, "! = ", FactResult
Loop:
      GOTO Loop
Factorial:
      IF Fact% < 1 THEN RETURN
      FactResult! = FactResult! * Fact%
      Fact% = Fact% -1
      GOSUB Factorial
      RETURN
```

4.7 Programming Style

The following are the guidelines used in writing programs in this manual, including the sample program. These guidelines are recommended for program readability, but they are not compulsory.

- Reserved words and symbolic constants appear in uppercase letters:

  ```
  PRINT "Portable Terminal Demo Program"
  BEEP(800,30,0,5,800,15,0,5,800,15)
  ```

- Variable names are in lowercase with an initial capital letter. If variable names are combined with more than one part, other capital letters may be used to make it easier to read:

  ```
  ProcessFlag% = 0
  Temp$ = GET_RECORD$(3,1)
  ```

- Line labels are used instead of line numbers:

  ```
  ON READER(2) GOSUB GetSlotReader
  ```

CHAPTER 5

BASIC Commands

This chapter provides detailed descriptions of the commands supported by the CipherLab BASIC Compiler. In addition to the commands commonly used in traditional versions of BASIC, a number of commands that deal with specific hardware features of the CipherLab portable terminals are supported. These commands are within user's BASIC programs to perform a wide variety of tasks, such as communications, LCD, buzzer, scanner, file manipulation, etc. They are categorized and described in this chapter by their functions or the resources they work on.

Some commands are postfixed with a dollar sign, $, which means a string is returned with the command. The compiler will accept these commands with or without the dollar sign. However, the dollar sign will be postfixed to these commands in this manual and the sample program.

The description for each BASIC command consists of five parts, ***Purpose***, ***Syntax***, ***Remarks***, ***Example*** and ***See Also***, which are further described below.

Purpose

The purpose of the command is briefly explained.

Syntax

According to the following conventions, the command syntax is described.

CAPS	: BASIC keywords are indicated by capital letters.
Italics	: Items in Italics represent variable information to be supplied by user.
[ ]	: Square brackets indicate optional parameters.
{ }	: Braces indicate an item may be repeated as many times as necessary.
|	: Vertical bar indicates alternative option.

Remarks

Additional information regarding correct command usage is provided.

Example

Various ways of using the statement are presented, including applicable and unusual modes of operation.

See Also

List of related commands is provided, if there is any.

Note: The types of terminals that support a specified BASIC command are listed to the right of the title bar of the command.

In This Chapter

5.1 General Commands

This section describes commands that are not confined to any specific hardware features.

ABS

Purpose To return the absolute value of a numeric expression.

Syntax ***A*** = ABS(***N***)

Remarks "***A***" is a numeric variable to be assigned to the absolute value of a numeric expression.

"***N***" is a numeric expression; it can be an integer or a real number.

Example TimeDifference% = ABS(Time1% - Time2%)

BIT_OPERATOR

Purpose To perform bit-wise operations of integers or long integers.

Syntax ***C*** = BIT_OPERATOR(***operator%, A, B***)

Remarks "***C***" is an integer (***C%***) or long integer variable (***C&***) to be assigned to the result.

"***operator%***" is an integer variable, indicating the bit-wise operator.

Operator%	Meaning
1	bit-wise AND
2	bit-wise OR
3	bit-wise XOR

"***A***" is an integer (***A%***) or long integer variable (***A&***), indicating the 1st operand.

"***B***" is an integer (***B%***) or long integer variable (***B&***), indicating the 2nd operand.

Example Result& = BIT_OPERATOR(2, 1100, 1000)

DIM

Purpose To specify the maximum value of variable subscripts and to allocate storage accordingly.

Syntax DIM ***Array*** (***range*** {***,range***}) {***, Array***(***range*** {***,range***})}

Remarks "***Array***" is an array variable.

"***range***" can be an integer or an integer expression.

The DIM statement sets all the elements of the specified arrays to an initial value of zero or empty string.

Note that the maximum allowable number of dimensions for an array is 2.

Example DIM A(10), B%(20), C$(30,10)

GOSUB

Purpose To call a specified subroutine.

Syntax GOSUB ***SubName***|***SubLabel***

Remarks "***SubName***" is the name of a subroutine.

"***SubLabel***" is the line label of a subroutine.

Example

```
   GOSUB DoIt
...
   GOSUB Done
...
SUB DoIt( )
   PRINT "Now I've done it!"
END SUB
...
Done:
   PRINT "Now I've done it!"
RETURN
```

GOTO

Purpose To branch out unconditionally to a specified line number of line label from the normal program sequence.

Syntax GOTO ***LineNumber***|***LineLabel***

Remarks "***LineNumber***" is the integer number in front of a program line.

"***LineLabel***" is the string label of a program line.

Example

```
Loop:
   GOTO Loop
```

INT

Purpose To return the largest integer that is less than or equal to the given numeric expression.

Syntax	***A%*** = INT(***N***)	
Remarks	"***A%***" is an integer variable to be assigned to the result.	
	"***N***" is a numeric expression.	
Example	A% = INT(-2.86)	' A% = -3
	B% = INT(2.86)	' B% = 2

REM

Purpose	To insert explanatory remarks in a program.	
Syntax	REM ***remark***	
	' ***remark***	
Remarks	"***remark***" may be any sequence of characters.	
	The BASIC compiler will ignore whatever follows the REM or ' until end of the line.	
Example	REM This is a comment.	' This is a comment.

SET_PRECISION

Purpose	To set the precision of the decimal points for printing real number expressions.	
Syntax	SET_PRECISION(***N%***)	
Remarks	"***N%***" is a numeric expression in the range of 0 to 6.	
	The precision is set to two digits by default.	
Example	PI! = 3.14159	
	PRINT "PI = ", PI!	' result: PI = 3.14 (by default)
	SET_PRECISION(6)	
	PRINT "PI = ", PI!	' result: PI = 3.141590
	SET_PRECISION(2)	
	PRINT "PI = ", PI!	' result: PI = 3.14

SGN

Purpose	To return an indication of the mathematical sign (+ or -) of a given numeric expression.
Syntax	***A***% = SGN(***N***)
Remarks	"***A%***" is an integer variable to be assigned to the result.

A%	Meaning
1	***N*** > 0
0	***N*** = 0
-1	***N*** < 0

"***N***" is a numeric expression.

Example

```
A% = SGN(100)          ' A% = 1
B% = SGN(-1.5)         ' B% = -1
```

5.2 Commands for Decision Structures

Based on the value of an expression, decision structures cause a program to take one of the following two actions:

- To execute one of several alternative statements within the decision structure itself.
- To branch to another part of the program outside the decision structure.

In CipherLab BASIC, decision-making is handled by the **IF...THEN...[ELSE...][ENDIF]** and **ON...GOSUB|GOTO...** statement. The **IF...THEN...[ELSE...][ENDIF]** statement can be used anywhere the **ON...GOSUB|GOTO...** statement can be used. The major difference between the two statements is that **ON...GOSUB|GOTO...** evaluates a single expression, and then executes different statements or branches to different parts of the program based on the result. On the contrary, a block **IF...THEN...[ELSE...][ENDIF]** can evaluate completely different expressions.

Moreover, the expression given in the **ON expression GOSUB|GOTO...** statement must be evaluated by a number in the range 1 to 255, while the expression in **IF...THEN...[ELSE...][ENDIF]** statement can only be evaluated as a TRUE or FALSE condition.

The **IF...THEN...[ELSE...][ENDIF]** statement can be nested up to 10 levels.

IF ... THEN ... [ELSE...]

Purpose To provide a decision structure for single-line conditional execution.

Syntax IF ***condition*** THEN ***action1*** [ELSE ***action2***]

Remarks "***condition***" is a logical expression.

"***action***" is a BASIC statement.

Example IF Data1% > Data2% THEN Temp% = Data1% ELSE Temp% = Data2%

IF ... THEN ... {ELSE IF...} [ELSE...] END IF

Purpose To provide a decision structure for multiple-line conditional execution.

Syntax IF ***condition1*** THEN

Statementblock1

{ELSE IF ***condition2*** THEN

Statementblock2}

[ELSE
   StatementblockN]
END IF

Remarks "***condition***" is a logical expression.

"***Statementblock***" can be multiple lines of BASIC statements.

Example

```
IF LEFT$(String1$,1) = "A" THEN
   PRINT "String1 is led by A."
ELSE IF LEFT$(String1$,1) = "B" THEN
   PRINT "String1 is led by B."
ELSE
   PRINT "String1 is not led by A nor B."
END IF
```

IF ... THEN ... END IF

Purpose To provide a decision structure for a conditional execution with multiple lines of actions.

Syntax

IF ***condition1*** THEN
   action1
   action2
   ...
END IF

Remarks "***condition***" is a logical expression.

"***action***" is a BASIC statement.

Example

```
IF Data1% > Large% THEN
   BEEP(800,30)
   Large% = Data1%
   PRINT "Current Largest Number is ", Data1%
END IF
```

ON ... GOSUB ...

Purpose To call one of the several specified subroutines depending on the value of the expression.

Syntax ON ***N*** GOSUB ***SubName|SubLabel*** {, ***SubName|SubLabel***}

Remarks "***N***" is a numeric expression that is rounded to an integer. The value of ***N*** determines which subroutine is to be called. If the value of ***N*** is 0, or greater than the number of routines listed, the interpreter will continue with the next executable statement.

"***SubName***" is the name of a subroutine.

"***SubLabel***" is the line label of a subroutine.

Example

```
PRINT "Input a number (1-9):"
INPUT Num%
CLS
ON Num% GOSUB 100, 100, 100, 200, 200, 300, 400, 400, 400
...
100
  PRINT "Number 1-3 is input."
  RETURN
200
  PRINT "Number 4-5 is input."
  RETURN
300
  PRINT "6 is input."
  RETURN
400
  PRINT "Number 7-9 is input."
  RETURN
...
```

ON ... GOTO ...

Purpose To branch to one of several specified Line Labels depending on the value of an expression.

Syntax ON ***N*** GOTO ***LineLabel*** {, ***LineLabel***}

Remarks "***N***" is a numeric expression which is rounded to an integer. The value of ***N*** determines which line label in the list will be used for branching. If the value ***N*** is 0, or greater than the number of line labels listed, the interpreter will continue with the next executable statement.

"***LineLabel***" is the string label of a program line.

Example

```
PRINT "Input a number (1-9):"
INPUT Num%
CLS
```

```
ON Num% GOTO 100, 100, 200, 200, 300, 400, 400, 400
...
100
   PRINT "Number 1-3 is input."
   GOTO 500
200
   PRINT "Number 4-5 is input."
   GOTO 500
300
   PRINT "6 is input."
   GOTO 500
400
   PRINT "Number 7-9 is input."
500
...
```

5.3 Commands for Looping Structures

Looping structures repeat a block of statements, either for a specified number of times or until a certain condition is matched. In CipherLab BASIC, two kinds of looping structures, **FOR...NEXT** and **WHILE...WEND** can be used. The command **EXIT** can be used as an alternative to exit from both **FOR...NEXT** and **WHILE...WEND** loops.

Both **FOR...NEXT** and **WHILE...WEND** statements can be nested up to 10 levels.

EXIT

Purpose To provide an alternative exit for looping structures, such as FOR...NEXT and WHILE...WEND statements.

Syntax EXIT

Remarks EXIT can appear anywhere within the loop statement.

Example

```
DataCount% = TRANSACTION_COUNT
FOR Counter% = 1 TO DataCount%
   Data$ = GET_TRANSACTION_DATA$(Counter%)
   HostCommand$ = READ_COM$(1)
   IF HostCommand$ = "STOP" THEN EXIT
   WRITE_COM(1,Data$)
NEXT
```

FOR ... NEXT

Purpose To repeat the execution of a block of statements for a specified number of times.

Syntax FOR ***N%*** = ***startvalue*** TO ***endvalue*** [STEP ***step***]

   [***Statement Block***]

NEXT [***N%***]

Remarks "***N%***" is an integer variable to be used as a loop counter.

"***startvalue***" is a numeric expression which is the initial value for the loop counter.

"***endvalue***" is a numeric expression which is the final value for the loop counter.

"***step***" is a numeric expression to be used as an increment/decrement of the loop counter The "step" is 1 by default.

If the loop counter ever reaches or beyond the endvalue, the program execution continues to the statement following the NEXT statement. The Statement block will be executed again otherwise.

Example

```
DataCount% = TRANSACTION_COUNT
FOR Counter% = 1 TO DataCount%
   Data$ = GET_TRANSACTION_DATA$(Counter%)
   WRITE_COM(1,Data$)
NEXT
```

WHILE ... WEND

Purpose To repeat the execution of a block of statements while a certain condition is TRUE.

Syntax

WHILE ***condition***

   [***Statement Block***]

WEND

Remarks If the "***condition***" is true, loop statements are executed until the WEND statement is encountered. Then the program execution returns to the WHILE statement and checks the condition again. If it is still true, the process will be repeated. Otherwise, the execution continues with the statement following the WEND statement.

Example

```
WHILE TRANSACTION_COUNT > 0
   Data$ = GET_TRANSACTION_DATA$(1)
   WRITE_COM(1,Data$)
   DEL_TRANSACTION_DATA(1)
WEND
```

5.4 Commands for String Processing

This section describes BASIC commands used to manipulate sequences of ASCII characters known as strings. In CipherLab BASIC, strings are always variable length, from null to a maximum of 250.

5.4.1 Combining Strings

Two strings can be combined with the plus operator " +". The string following the plus operator is appended to the string preceding the plus operator. For example,

```
...
Data$ = DATE$ + TIME$ + EmployeeID$
SAVE_TRANSACTION(Data$)
...
```

5.4.2 Comparing Strings

Two strings can be compared with the relational operators, see section 4.3.3. A single character is greater than another character if its ASCII value is greater. For example, the ASCII value of the letter "B" is greater than the ASCII value of the letter "A", so the expression "B" > "A" is true.

When comparing two strings, BASIC looks at the ASCII values of corresponding characters. The first character where the two strings differ determines the alphabetical order of the strings. For example, the strings "aaabaa" and "aaaaaaaa" are the same up to the fourth character in each, "b" and "a". Since the ASCII value of "b" is larger than that of "a", the expression "aaabaa" > "aaaaaaaa" is true.

If there is no difference between the corresponding characters of two strings and they are the same length, then the two strings are equal. If there is no difference between the corresponding characters of two strings, but one of the strings is longer, the longer string is greater than the shorter string. For example, "abc" = "abc" and "aaaaaaaa" > "aaaaa" are both true expressions.

Leading and trailing blank spaces are significant in comparing strings. For example, the string " abc" is less than the string "abc" since a blank space is less than an "a"; on the other hand, the string "abc " is greater than the string "abc".

5.4.3 Getting the Length of a String

LEN

Purpose To return the length of a string.

Syntax ***A%*** = LEN(***X$***)

Remarks "***A%***" is an integer variable to be assigned to the result.

"***X$***" may be a string variable, string expression, or string constant.

Note that non-printing characters and blanks are counted.

Example

```
String1$ = "abcde "
A% = LEN(String1$)                    'A% = 6, including the blank
```

5.4.4 Searching for Strings

Searching for a string inside another one is one of the most common string-processing tasks. **INSTR** is provided for this task.

INSTR

Purpose To search if one string exists inside another one.

Syntax ***A%*** = INSTR([***N%***,] ***X$***, ***Y$***)

Remarks "***A%***" is an integer variable to be assigned to the result.

"***N%***" is a numeric expression in the range of 1 to 255. Optional offset ***N*** sets the position for starting the search.

"***X$***", "***Y$***" may be a string variable, string expression, or string constant.

If ***Y$*** is found in ***X$***, INSTR returns the position of the first occurrence of ***Y$*** in ***X$***, from the starting point.

If ***N*** is larger than the length of ***X$*** or if ***X$*** is null, of if ***Y$*** cannot be found, INSTR returns 0.

If ***Y$*** is null, INSTR returns ***N*** (or 1 if ***N*** is not specified).

Example

```
String1$ = "11025John Thomas, Accounting Manager"
String2$ = ","
EmployeeName$ = MID$(String1$, 6, INSTR(String1$, String2$) - 6)
' the employee's name starts at the sixth character
```

5.4.5 Retrieving Part of Strings

Several commands are provided to take strings apart by returning pieces of a string, from the left side, or the right side, or the middle of the target string.

LEFT$

Purpose	To retrieve a given number of characters from the left side of the target string.
Syntax	***A$*** = LEFT$(***X$***, ***N%***)
Remarks	"***A$***" is a string variable to be assigned to the result.
	"***X$***" may be a string variable, string expression, or string constant.
	"***N%***" is a numeric expression in the range of 0 to 255.
	If ***N*** is larger than the length of ***X$***, the entire string (***X$***) is returned.
	If ***N*** is zero, the null string (with lenght 0) is returned.
Example	String1$ = "11025John Thomas, Accounting Manager"
	EmployeeID$ = LEFT$(String1$, 5)

MID$

Purpose	To retrieve a given number of characters from anywhere of the target string.
Syntax	***A$*** = MID$(***X$***, ***N%***[, ***M%***])
Remarks	"***A$***" is a string variable to be assigned to the result.
	"***X$***" may be a string variable, string expression, or string constant.
	"***N%***" and "***M%***" are numeric expressions in the range of 0 to 255.
	This command returns a string of length ***M*** characters from ***X$*** beginning with the ***N***th character.
	If ***M*** is omitted, or if there are fewer than ***M*** characters to the right of the ***N***th character, all the characters beginning with the ***N***th character to the rightmost are returned.
	If ***M*** is equal to zero, or if ***N*** is greater than the length of ***X$***, then MID$ returns a null string.
Example	String1$ = "11025John Thomas, Accounting Manager"
	String2$ = ","
	EmployeeName$ = MID$(String1$, 6, INSTR(String1$, String2$) - 6)
	' the employee's name starts at the sixth character

RIGHT$

Purpose To retrieve a given number of characters from the right side of the target string.

Syntax ***A$*** = RIGHT$(***X$***, ***N%***)

Remarks "***A$***" is a string variable to be assigned to the result.

"***X$***" may be a string variable, string expression, or string constant.

"***N%***" is a numeric expression in the range of 0 to 255.

If ***N*** is larger than the length of ***X$***, the entire string is returned.

If ***N*** is zero, the null string (with length 0) is returned.

Example

```
String1$ = "11025John Thomas, Accounting Manager"
String2$ = ","
Title$ = RIGHT$(String1$, LEN(String1$) - INSTR(String1$, String2$))
```

TRIM_LEFT$

Purpose To return a copy of a string with leading blank spaces stripped away.

Syntax ***A$*** = TRIM_LEFT$(***X$***)

Remarks "***A$***" is a string variable to be assigned to the result.

"***X$***" is a string variable that may contain some space characters at the beginning.

Example

```
S1$ = TRIM_LEFT$("  Hello World!")    ' S1$ = "Hello World!"
```

TRIM_RIGHT$

Purpose To return a copy of a string with trailing blank spaces stripped away.

Syntax ***A$*** = TRIM_RIGHT$(***X$***)

Remarks "***A$***" is a string variable to be assigned to the result.

"***X$***" is a string variable that may contain some space characters at the end.

Example

```
S2$ = TRIM_RIGHT$("Hello World!  ")  ' S2$ = "Hello World!"
```

5.4.6 Converting for Strings

Several commands are available for converting strings to uppercase or lowercase letters, as well as converting strings to numbers, and vice versa.

ASC

Purpose To return the decimal value for the ASCII code for the first character of a given string.

Syntax ***A%*** = ASC(***X$***)

Remarks "***A%***" is an integer variable to be assigned to the result.

"***X$***" is a string variable, consisting of characters.

Example A% = ASC("John Thomas") ' A% = 74

CHR$

Purpose To return the character for a given ASCII value.

Syntax ***A$*** = CHR$(***N%***)

Remarks "***A$***" is a string variable to be assigned to the result.

"***N%***" is a numeric expression in the range of 0 to 255.

Example A$ = CHR$(65) ' A$ = "A"

HEX$

Purpose To return a string that represents the hexadecimal value (base 16) of the decimal argument.

Syntax ***A$*** = HEX$(***N%***)

Remarks "***A$***" is a string variable to be assigned to the result.

"***N%***" is a numeric expression in the range of 0 to 2,147,483,647; it is rounded to an integer before HEX$(***N%***) is evaluated.

Example A$ = HEX$(140) ' A$ = "8C"

LCASE$

Purpose To return a copy of a string in which all uppercase letters will be converted to lowercase letters.

Syntax ***A$*** = LCASE$(***X$***)

Remarks "***A$***" is a string variable to be assigned to the result.

"***X$***" may be a string variable, string expression, or string constant.

Example String1$ = "John Thomas"

String2$ = LCASE$(String1$) ' String2$ = "john thomas"

OCT$

Purpose To convert a decimal numeric expression to a string that represents the value of the numeric expression in octal notation.

Syntax ***A$*** = OCT$(***N%***)

Remarks "***A$***" is a string variable to be assigned to the result.

"***N%***" is a numeric expression in the range 0 to 2,147,483,647; it is rounded to an integer before OCT$(***N%***) is evaluated.

Example A$ = OCT$(24) ' A$ = "30"

STR$

Purpose To convert a numeric expression to a string.

Syntax ***A$*** = STR$(***N%***)

Remarks "***A$***" is a string variable to be assigned to the result.

"***N%***" is a numeric expression.

Example String$ = STR$(123)

UCASE$

Purpose To return a copy of a string in which all lowercase letters will be converted to uppercase letters.

Syntax ***A$*** = UCASE$(***X$***)

Remarks "***A$***" is a string variable to be assigned to the result.

"***X$***" may be a string variable, string expression, or string constant.

Example String1$ = "John Thomas"

String2$ = UCASE$(String1$) ' String2$ = "JOHN THOMAS"

VAL

Purpose To return the numeric value of a string expression in long integer form.

Syntax ***A&*** = VAL$(***X$***)

Remarks "***A&***" is an integer or long integer variable to be assigned to the result.

"***X$***" is a string that includes numeric characters. If the first character is not numeric, this command returns 0. The command VAL will strip leading blanks, tabs, and linefeeds from the argument string. The return numeric value is in the range of - 2,147,483,648 to 2,147,483,647.

Example

```
ON HOUR_SHARP GOSUB
OnHourAlarm

...

OnHourAlarm:

  Hour% = VAL(LEFT$(TIME$,2))

  FOR Counter% = 1 TO Hour%

      BEEP(800,50)

      WAIT(200)

NEXT

RETURN
```

VALR

Purpose To convert a string expression to a real number.

Syntax ***A!*** = VALR(***X$***)

Remarks "***A!***" is a real number variable to be assigned to the result.

"***X$***" is a string that includes numeric characters. The precision of the converted result is governed by the command SET_PRECISION.

Example

```
A! = VALR("123.45")

PRINT "A = ", A!                    REM A = 123.45

...
```

5.4.7 Creating Strings of Repeating Characters

STRING$

Purpose To return a string containing the specified number of the requested character.

Syntax ***A$*** = STRING$(***N%***, ***J%***)

A$*** = STRING$(N%***, ***X$***)

Remarks "***A$***" is a string variable to be assigned to the result.

"***N%***" is a numeric expression in the range of 0 to 255, indicating the number of a character.

"***J%***" is a numeric expression in the range of 0 to 255, indicating the ASCII code of a character.

"***X$***" may be a string variable or string constant.

Example

```
IDX_LENGTH% = 20
Data$ = Name$ + STRING$(IDX_LENGTH% - LEN(Name$)," ")
ADD_RECORD$(1,Data$)
' padding with space if the length of Name$ is less than IDX_LENGTH%
```

5.5 Commands for Event Trapping

An event is an action recognized by the terminal, such as a function keystroke is detected (KEY event), a signal is received from the serial port (COM event), and so on. There are two ways to detect the occurrence of an event and reroute the program control to an appropriate subroutine: polling and trapping.

With event polling, the BASIC program explicitly checks for any event that happens at a particular point in its execution. For example, the following statements cause the program to loop back and forth until any key being pressed by user:

```
Loop:

    KeyData$ = INKEY$

    IF KeyData$ = "" THEN GOTO Loop

   ...
```

Polling is useful when the occurrence of an event is predictable in the flow of the program. But if the time of the occurrence of an event is not predictable, trapping becomes the better alternative because the program will not be paused by the looping statements. For example, the following statements cause the program rerouting to the Key_F1 subroutine when the key F1 is pressed at anytime.

```
    ON KEY(1) GOSUB Key_F1

    ...

Key_F1:

    ...
```

This section describes a variety of events that the CipherLab BASIC can trap as well as the related commands.

5.5.1 Event Triggers

Below are 10 different events that can be trapped.

1. COM Event: a signal is received from the COM port.

2. ESC Event: the ESC key is pressed.
3. HOUR_SHARP Event: the system time is on the hour.
4. KEY Event: a function key is pressed.
5. MINUTE_SHARP Event: the system time is on the minute.
6. READER Event: a barcode data is decoded.
7. TCPIP Event: any data packet is received via TCP/IP.
8. TIMER Event: a time-out condition of an activated timer.
9. TOUCHSCREEN Event: a touchable item is activated by selecting.
10. POWER_ON Event: the POWER key is pressed after powering off the terminal.

OFF ALL

Purpose To terminate all the event triggers.

Syntax OFF ALL

Remarks To resume the event trigger, call ON ***event*** GOSUB...

Example

```
ON READER(1) GOSUB BcrData_1
ON READER(2) GOSUB BcrData_2
ON KEY(1) GOSUB KeyData_1
...
IF BACKUP_BATTERY < BATTERY_LOW% THEN
   OFF ALL
   BEEP(2000,30)
   CLS
   PRINT "Backup Battery needs to be replaced!"
   Loop:
      GOTO Loop
END IF
...
```

See Also OFF COM, OFF ESC, OFF HOUR_SHARP, OFF KEY, OFF MINUTE_SHARP, OFF READER, OFF TCPIP, OFF TIMER, OFF TOUCHSCREEN

OFF COM

Purpose To terminate "COM Event Trigger".

Syntax OFF COM(***N%***)

Remarks To resume the event trigger, call ON COM... GOSUB...

"***N%***" is an integer variable, indicating the COM port.

N%	Available on terminals:
1 ~ 2	711, 8100, 8000, 8300
1 ~ 4	8500

Example

```
  ON COM(1) GOSUB HostCommand
  ...
HostCommand_1:
  OFF COM(1)    REM disable the trapping during data processing.
  ...
  ON COM(1) GOSUB HostCommand
  RETURN
```

See Also ON COM... GOSUB...

OFF ESC

Purpose To terminate "ESC Event Trigger".

Syntax OFF ESC

Remarks To resume the event trigger, call ON ESC GOSUB...

Example

```
  ON ESC GOSUB Key_Esc
  ...
Key_Esc:
  OFF ESC
  ...
  ON ESC GOSUB Key_Esc
  RETURN
```

See Also ON ESC GOSUB...

OFF HOUR_SHARP

Purpose To terminate "HOUR_SHARP Event Trigger".

Syntax OFF HOUR_SHARP

Remarks To resume the event trigger, call ON HOUR_SHARP GOSUB...

Example OFF HOUR_SHARP

See Also ON HOUR_SHARP GOSUB...

OFF KEY

Purpose To terminate "FUNCTION KEY Event Trigger".

Syntax OFF KEY(***number%***)

Remarks To resume the event trigger, call ON KEY... GOSUB...

"***number%***" is an integer variable in the range of 1 to 12 (1 to 9 for 711), indicating a function key of the keypad.

Example

```
   ON KEY(1) GOSUB On_Shift
   ON KEY(2) GOSUB Off_Shift
   ...
On_Shift:
   OFF KEY
   Mode$ = "IN"
   GOSUB Process
   ON KEY(1) GOSUB On_Shift
   RETURN
   ...
```

See Also ON KEY... GOSUB...

OFF MINUTE_SHARP

Purpose To terminate "MINUTE_SHARP Event Trigger".

Syntax OFF MINUTE_SHARP

Remarks To resume the event trigger, call ON MINUTE_SHARP GOSUB...

Example OFF MINUTE_SHARP

See Also ON MINUTE_SHARP GOSUB...

OFF READER

Purpose To terminate "READER Event Trigger".

Syntax OFF READER(***N%***)

Remarks To resume the event trigger, call ON READER... GOSUB...

"***N%***" is an integer variable, indicating the reader port (usually 1 for portable terminals).

Example

```
   ON READER(1) GOSUB BcrData_1
   ...
BcrData_1:
   OFF READER(1)
   BEEP(2000,5)
   Data$ = GET_READER_DATA$(1)
   CLS
   PRINT Data$
   ...
```

See Also ON READER... GOSUB...

OFF TCPIP — 8000, 8300, 8500

Purpose To terminate "TCP/IP Event Trigger".

Syntax OFF TCPIP

Remarks To resume the event trigger, call ON TCPIP GOSUB...

Example OFF TCPIP

See Also ON TCPIP GOSUB...

OFF TIMER

Purpose To terminate "TIMER Event Trigger".

Syntax OFF TIMER(***N%***)

Remarks To resume the event trigger, call ON TIMER... GOSUB...

"***N%***" is an integer variable in the range of 1 to 5, indicating the timer ID.

Example

```
   ON TIMER(1,200) GOSUB ClearScreen              ' TIMER(1) = 2 sec
   ...
ClearScreen:
   OFF TIMER(1)
   CLS
   RETURN
```

See Also ON TIMER... GOSUB...

OFF TOUCHSCREEN — 8500

Purpose To terminate "TOUCHSCREEN Event Trigger".

Syntax OFF TOUCHSCREEN

Remarks To resume the event trigger, call ON TOUCHSCREEN GOSUB...

Example OFF TOUCHSCREEN

See Also ON TOUCHSCREEN GOSUB...

ON COM ... GOSUB ...

Purpose To activate "COM Event Trigger".

Syntax ON COM(***N%***) GOSUB ***SubName|SubLabel***

Remarks When data is received from the COM port, a specific subroutine will be executed.

"***N%***" is an integer variable, indicating the COM port.

N%	Available on terminals:
1 ~ 2	711, 8100, 8000, 8300
1 ~ 4	8500

"***SubName|SubLabel***" is the name or line label of a subroutine.

Example

```
  ON COM(1) GOSUB HostCommand
  ...
HostCommand_1:
  OFF COM(1)
  ...
  ON COM(1) GOSUB HostCommand
  RETURN
```

See Also Communication Ports commands, OFF COM

ON ESC GOSUB ...

Purpose To activate "ESC Event Trigger".

Syntax ON ESC GOSUB ***SubName|SubLabel***

Remarks When the ESC key is pressed, a specific subroutine will be executed.

"***SubName|SubLabel***" is the name or line label of a subroutine.

Example

```
  ON ESC GOSUB Key_Esc
  ...
Key_Esc:
  OFF ESC
  ...
  ON ESC GOSUB Key_Esc
  RETURN
```

See Also Keypad commands, OFF ESC

ON HOUR_SHARP GOSUB ...

Purpose To activate "HOUR_SHARP Event Trigger".

Syntax ON HOUR_SHARP GOSUB ***SubName|SubLabel***

Remarks When the system time is on the hour, a specific subroutine will be executed.

"***SubName|SubLabel***" is the name or line label of a subroutine.

Example

```
  ...
  ON HOUR_SHARP GOSUB OnHourAlarm
  ...
OnHourAlarm:
  CurrentTime$ = TIME$
  Hour% = VAL(LEFT$(CurrentTime$,2))
  FOR I = 1 TO Hour%
    BEEP(800,10,0,10)
    WAIT(100)
  NEXT
  RETURN
```

See Also Calendar & Timer commands, OFF HOUR_SHARP

ON KEY ... GOSUB ...

Purpose To activate "FUNCTION KEY Event Trigger".

Syntax ON KEY(***number%***) GOSUB ***SubName|SubLabel***

Remarks When a function key is pressed, a specific subroutine will be executed.

"***number%***" is an integer variable in the range of 1 to 12 (1 to 9 for 711), indicating a function key of the keypad.

"***SubName|SubLabel***" is the name or line label of a subroutine.

Example

```
  ON KEY(1) GOSUB On_Shift
  ON KEY(2) GOSUB Off_Shift
  ...
On_Shift:
  Mode$ = "IN"
    RETURN
```

```
Off_Shift:
  Mode$ = "OUT"
    RETURN
```

See Also Keypad commands, OFF KEY

ON MINUTE_SHARP GOSUB ...

Purpose To activate "MINUTE_SHARP Event Trigger".

Syntax ON MINUTE_SHARP GOSUB ***SubName|SubLabel***

Remarks When the system time is on the minute, a specific subroutine will be executed.

"***SubName|SubLabel***" is the name or line label of a subroutine.

Example

```
  ...
  ON MINUTE_SHARP GOSUB CheckTime
  ...
CheckTime:
  CurrentTime$ = TIME$
  Hour% = VAL(MID$(CurrentTime$,3,2))
  IF Hour% = 30 THEN GOSUB HalfHourAlarm
  RETURN
  ...
HalfHourAlarm:
  BEEP(800,30)
  WAIT(100)
  RETURN
```

See Also Calendar & Timer commands, OFF MINUTE_SHARP

ON POWER_ON GOSUB ...

Purpose To activate "POWER_ON Event Trigger".

Syntax ON POWER_ON GOSUB ***SubName|SubLabel***

Remarks When the POWER key is pressed again after powering off the terminal, a specific subroutine will be executed.

"***SubName|SubLabel***" is the name or line label of a subroutine.

Example

```
  ON POWER_ON GOSUB RESUME_ON
MAIN1:
        …
```

```
   ON POWER_ON GOSUB RESUME_ON
MAIN1:
            …
            LOCATE 8, 1
            PWR_INDEX1&=PWR_INDEX&
            PRINT "[POWER ON]", PWR_INDEX1&
MAIN2:
            IF PWR_INDEX& > PWR_INDEX1& THEN
               GOTO MAIN1
            END IF
            …
            GOTO MAIN2

RESUME_ON:
            PWR_INDEX&=PWR_INDEX&+1
            WAIT (100)
            RETURN
```

See Also

ON READER ... GOSUB ...

Purpose To activate "READER Event Trigger".

Syntax ON READER(*N%*) GOSUB ***SubName|SubLabel***

Remarks When data is received from the reader port, a specific subroutine will be executed.

"***N%***" is an integer variable, indicating the reader port (usually 1 for portable terminals).

"***SubName|SubLabel***" is the name or line label of a subroutine.

Example

```
   ON READER(1) GOSUB BcrData_1
   ...
BcrData_1:
   OFF READER(1)
   BEEP(2000,5)
   Data$ = GET_READER_DATA$(1)
   ...
```

See Also General Reader commands, OFF READER

ON TCPIP GOSUB... 8000, 8300, 8500

Purpose To activate "TCP/IP Event Trigger".

Syntax ON TCPIP GOSUB ***SubLabel***

Remarks When data is received from any TCP/IP connection or some error is taking place, a specific subroutine will be executed.

"***SubLabel***" is the line label of a subroutine.

The GET_TCPIP_MESSAGE routine is used to identify the status of TCP/IP connections.

Example

```
ON TCPIP GOSUB TCPIP_Trigger
...
TCPIP_Trigger:
MSG = GET_TCPIP_MESSAGE
...
```

See Also OFF TCPIP, TCP/IP Networking commands

ON TIMER ... GOSUB ...

Purpose To activate "TIMER Event Trigger".

Syntax ON TIMER(***N%, duration%***) GOSUB ***SubName|SubLabel***

Remarks When the system runs out of the time duration specified by user, a specific subroutine will be executed.

Up to five timers can be set in a BASIC program. Be sure the timer IDs are different. Otherwise, the latter created timer will overwrite the former one.

"***N%***" is an integer variable in the range of 1 to 5, indicating the ordinal number of timer.

"***duration%***" is an integer variable, indicating a specified period of time in units of 10 ms.

"***SubName|SubLabel***" is the name or line label of a subroutine.

Example

```
   ON TIMER(1, 200) GOSUB ClearScreen          ' TIMER(1) = 2 sec
   ...
ClearScreen:
   OFF TIMER(1)
   CLS
   RETURN
```

See Also Calendar & Timer commands, OFF TIMER

ON TOUCHSCREEN GOSUB... 8500

Purpose To activate "TOUCHSCREEN Event Trigger".

Syntax ON TOUCHSCREEN GOSUB ***SubName|SubLabel*** {, ***SubName|SubLabel***}

Remarks When the touch screen is enabled, a specific subroutine will be executed.

"***SubName|SubLabel***" is the name or line label of a subroutine.

Example

```
  ON TOUCHSCREEN GOSUB CHECK_FUN
  ...
CHECK_FUN:
  NO% = GET_SCREENITEM
  RETURN
```

See Also OFF TOUCHSCREEN, Touch Screen commands

5.5.2 Lock and Unlock

Event trapping could be nested. If the event triggers are activated in a BASIC program, it is possible that an event-driven subroutine can be interrupted by any upcoming events. Normally, the new event would be processed first. In some cases where we don't want the event-driven subroutine to be interrupted by other events, the commands **LOCK** and **UNLOCK** can be used to hold off new events.

LOCK

Purpose To hold all the activated event triggers until they are released by UNLOCK.

Syntax LOCK

Remarks This command can prevent nesting of event triggers. All the activated event triggers will be disabled until UNLOCK is called.

Example

```
  ON READER(1) GOSUB BcrData_1
  ON READER(2) GOSUB BcrData_2
  ...
BcrData_1:
  LOCK
  BEEP(2000,5)
  Data$ = GET_READER_DATA$(1)
  GOSUB AddNewData
  UNLOCK
  RETURN
```

```
    ...
BcrData_2:
    BEEP(2000,5)
    Data$ = GET_READER_DATA$(2)
    GOSUB AddNewData
    RETURN
```

In this example, the BASIC program can trap the READER(1) and READER(2) events and reroute to the subroutines BcrData_1 and BcrData_2 respectively. In BcrData_1, the command LOCK disables all the activated event triggers so that the subroutine BcrData_1 will not be interrupted by a new upcoming READER(1) and/or READER(2) event. On the other hand, since LOCK is not called in BcrData_2, any new coming READER(1) and READER(2) event will interrupt the ongoing BcrData_2, and therefore, may affect the expected results.

See Also UNLOCK

UNLOCK

Purpose To release all the activated event triggers held by LOCK.

Syntax UNLOCK

Remarks This command resumes event processing.

Example Refer to the command LOCK.

See Also LOCK

5.6 System Commands

This section describes the system commands, such as the commands to change the CPU running speed, get the device ID, and/or restart the system.

5.6.1 General

AUTO_OFF

Purpose To set a specified period of time for the system to automatically shut down user's program as long as there is no operation in the interval.

Syntax AUTO_OFF(***N%***)

Remarks "***N%***" is an integer variable, indicating a specified period of time in units of 1 second. If the time interval is set to zero, this function will be disabled.

Example

```
AUTO_OFF(30)        ' auto off after 30 seconds
AUTO_OFF(0)         ' disable the AUTO OFF function
```

See Also POWER_ON, RESTART

CHANGE_SPEED **711, 8100, 8000, 8300**

Purpose To change the CPU running speed.

Syntax CHANGE_SPEED(***N%***)

Remarks When the system is not heavy loaded, e.g. waiting for data input, it is suggested to change the CPU running speed to a lower level to reduce the power consumption.

"***N%***" is an integer variable in the range of 1 to 5, indicating the CPU running speed.

N%	Meaning
1	Sixteenth speed
2	Eighth speed
3	Quarter speed
4	Half speed
5	Full speed

Example CHANGE_SPEED(3)

DEVICE_ID$

Purpose To get the serial number of the terminal.

Syntax ***A$*** = DEVICE_ID$

Remarks **This command is to be replaced by SYSTEM_INFORMATION$.**

"***A$***" is a string variable to be assigned to the result. That is, a string of the terminal's serial number will be returned.

Such information can be checked in the System Menu> Information> S/N.

Example PRINT "S/N:", DEVICE_ID$

GET_LANGUAGE 8000, 8300, 8500

Purpose To retrieve the font/language setting.

Syntax ***A%*** = GET_LANGUAGE

Remarks "***A%***" is an integer variable to be assigned to the result.

A%	Meaning	Code Page
0	System font	---
1	Traditional Chinese font	Big-5, 16x16 dots
2	Simplified Chinese font	GB code, 12x16 dots
3	Simplified Chinese font	GB code, 16x16 dots
4	Korean font	---
5	Japanese font	---
6	Hebrew font	---
7	Polish font	---
8	Russian font	---
9	Traditional Chinese font	Big-5, 12x12 dots
10	Reserved	---
11	Simplified Chinese font	GB code, 12x12 dots
12	Japanese font	12x12 dots
16	English	MS-DOS Code page 437
17	Canadian French	MS-DOS Code page 863
18	Hebrew	MS-DOS Code page 862
19	Multilingual Latin I	MS-DOS Code page 850
20	Nordic	MS-DOS Code page 865
21	Portuguese	MS-DOS Code page 860
22	Cyrillic (Russian)	Windows Code page 1251

23	Latin II (Slavic)	MS-DOS Code page 852
24	Central European, Latin II (Polish)	Windows Code page 1250
25	Turkish	MS-DOS Code page 857
26	Latin II (Slovak)	---
27	Windows 1250	---
28	ISO-28592 (Latin 2)	ISO 8859-2
29	IBM-LATIN II	---
30	Greek	MS-DOS Code page 737
31	Latin I	Windows Code page 1252
32	Greek	Windows Code page 1253

Example language% = GET_LANGUAGE

See Also SET_LANGUAGE

GET_TARGET_MACHINE$

Purpose To get the model number of the target terminal.

Syntax ***A$*** = GET_TARGET_MACHINE$

Remarks "***A$***" is a string variable to be assigned to the result. That is, a string of the terminal's model number will be returned.

Example

```
A$ = GET_TARGET_MACHINE
IF (A$ = "711") THEN
...
ELSE IF (A$ = "8000") THEN
...
ELSE IF (A$ = "8300") THEN
...
END IF
```

MENU

Purpose To create a menu.

Syntax ***A%*** = MENU(***Item$***)

Remarks "***A%***" is an integer variable to be assigned to the result.

It is the ordinal number of the menu item that user has selected. If the ESC key is pressed to cancel the operation, it will return 0.

"***Item$***" is a string variable, indicating the menu items that are separated and ended by carriage return (CR, 0x0d).

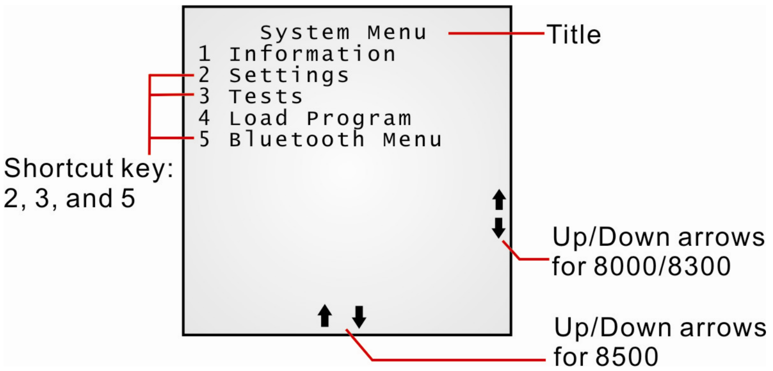
This command lets user select an item by using (1) the UP/DOWN arrow keys, and then the ENTER key to confirm the selection, or (2) the shortcut keys.

Note that the following features are for the 8000/8300/8500 series only -

- Shortcut key: & (It is restricted to only one character next to &.)
- Menu title: @ (The title can be put anywhere in the menu string.)
- Display the Up/Down arrow icons

Example Below is an illustrative example:

```
MENU_STR$ = "1 INFORMATION" + CHR$(13)
MENU_STR$ = MENU_STR$ + "@SYSTEM MENU" + CHR$(13)
MENU_STR$ = MENU_STR$ + "&2 SETTINGS" + CHR$(13)
MENU_STR$ = MENU_STR$ + "&3 TESTS" + CHR$(13)
MENU_STR$ = MENU_STR$ + "4 LOAD PROGRAM" + CHR$(13)
MENU_STR$ = MENU_STR$ + "&5 BLUETOOTH MENU" + CHR$(13)
...
S% = MENU(MENU_STR$)
...
```


```
   System Menu
1 Information
2 Settings
3 Tests
4 Load Program
5 Bluetooth Menu
```

POWER_ON

Purpose To determine whether to restart or resume the program upon powering on.

Syntax POWER_ON(***N%***)

Remarks "***N%***" can be 0 or 1.

N%	Meaning
0	Resume
1	Restart

Example POWER_ON(0) ' set to resume mode

See Also AUTO_OFF, RESTART

RESTART

Purpose To restart the system.

Syntax RESTART

Remarks This command will terminate the execution of the BASIC program and restart it.

Example

```
HostCommand$ = READ_COM$(1)
...
IF HostCommand$ = "RESTART" THEN
   RESTART
ELSE
...
```

See Also AUTO_OFF, POWER_ON

SET_LANGUAGE 8000, 8300, 8500

Purpose To select which language is to be used for the multi-language font file.

Syntax SET_LANGUAGE(***N%***)

Remarks Note that this command will fail if the multi-language font file does not exist.

"***N%***" is an integer variable in the range of 16 to 32.

N%	Meaning	Code Page
16	English	MS-DOS Code page 437
17	Canadian French	MS-DOS Code page 863
18	Hebrew	MS-DOS Code page 862
19	Multilingual Latin I	MS-DOS Code page 850
20	Nordic	MS-DOS Code page 865
21	Portuguese	MS-DOS Code page 860
22	Cyrillic (Russian)	Windows Code page 1251
23	Latin II (Slavic)	MS-DOS Code page 852
24	Central European, Latin II (Polish)	Windows Code page 1250
25	Turkish	MS-DOS Code page 857
26	Latin II (Slovak)	---
27	Windows 1250	Windows 1250
28	ISO-28592 (Latin 2)	ISO-28592 (Latin 2)
29	IBM-LATIN II	---

30	Greek	MS-DOS Code page 737
31	Latin I	Windows Code page 1252
32	Greek	Windows Code page 1253

Example SET_LANGUAGE (17) ' select French

See Also GET_LANGUAGE, SELECT_FONT

SYSTEM_INFORMATION$

Purpose To collect information on components, either hardware or software.

Syntax ***A$*** = SYSTEM_INFORMATION$(***index%***)

Remarks "***A$***" is a string variable to be assigned to the result.

"***index%***" is an integer variable, indicating a specific category of information.

index%	Meaning	
1	Library Version	: C library
2	BASIC Version	: BASIC runtime
3	Kernel Version	
4	Hardware Version	
5	Manufacture Date	
6	Serial Number	
7	Original Serial Number	
8	Device Type	: modular components in hardware
9	RFID Version	

Example
```
LIBVER$=SYSTEM_INFORMATION$(1)
PRINT "Library :",LIBVER$
```

SYSTEM_PASSWORD

Purpose To set the password protection for entering the System Menu.

Syntax SYSTEM_PASSWORD(***A$***)

Remarks "***A$***" is a string constant or variable, representing the password.

Example SYSTEM_PASSWORD("12345")

VERSION

Purpose To write version information to the system.

Syntax VERSION(***A$***)

Remarks "***A$***" is a string variable, indicating program name, date, etc.

This command is used to write information of program version to the system. Such information can be checked in the System Menu> Information> USR.

Note that this command must be on the first line of the program; otherwise, it will be ignored. The string for version information cannot exceed 15 characters.

Example VERSION("CipherBASIC 2.0") ...

5.6.2 Format of Device ID

Being one category of system information, the device type is displayed as "xxx0", where each is a digit from 0 to 9. The last digit ("0") is reserved for future use. It is also referred to as "Device ID".

Digits:	**x**	**x**	**x**	**x**
Types:	Reader Module	Wireless Module	Others: 8000: Battery type 8100: Battery type 8300: CCD/Laser 8500: RFID module	Reserved

8000 Series

Device Type	**Meaning**
0xxx	No reader
1xxx	CCD scan engine
2xxx	Laser scan engine
x0xx	No wireless module
x4xx	802.11b module
x5xx	Bluetooth module
x6xx	Acoustic coupler module
xx0x	2*AAA Alkaline battery
xx1x	Rechargeable Li-ion battery

8100 Series

Device Type	Meaning
0xxx	No reader
1xxx	CCD scan engine
2xxx	Laser scan engine
x0xx	No wireless module
x1xx	433 MHz module
x2xx	2.4 GHz module
xx0x	2*AAA Alkaline battery
xx1x	Rechargeable Li-ion battery

8300 Series

For hardware version 4.0, when the first digit is “2”, it may refer to CCD or Laser scan engine. You will need to check the fourth digit: “1” for CCD, “0” for Laser.

Device Type	Meaning
0xxx	No reader
1xxx	CCD scan engine (Not applicable to H/W version 4.0)
2xxx	Laser scan engine CCD or Laser scan engine (for H/W version 4.0)
4xxx	Long Range Laser scan engine
x0xx	No wireless module
x1xx	433 MHz module
x2xx	2.4 GHz module
x4xx	802.11b module
x5xx	Bluetooth module
x8xx	802.11b + Bluetooth
xx0x	No RFID
xx1x	RFID module
xxx0	None
xxx1	CCD scan engine* (for H/W version 4.0)

8500 Series

Device Type	Meaning
0xxx	No reader
1xxx	CCD scan engine
2xxx	Laser scan engine
3xxx	2D scan engine
4xxx	Long Range Laser scan engine
5xxx	Extra Long Range Laser scan engine
x0xx	No wireless module
x3xx	GSM/GPRS + Bluetooth
x4xx	802.11b + Bluetooth
x5xx	Bluetooth module only
x7xx	802.11b + GSM/GPRS + Bluetooth
xx0x	No RFID
xx1x	RFID module

5.7 Barcode Reader Commands

The CipherLab terminals are able to read barcode data from the reader ports. This section describes the BASIC commands that are related to the reader ports of the terminals.

Commands for triggering the READER event: **OFF READER(1)**, **ON READER(1) GOSUB...**

The reader module supports a number of scan engines to meet your needs:

- CCD scan engine
- Laser scan engine
- Long Range Laser scan engine (available for the 8300/8500 series)
- Extra Long Range Laser scan engine (available for the 8500 series only)
- 2D scan engine (available for the 8500 series only)

Note: (1) CCD and Laser scan engines support 9 scan modes. (2) 2D and (Extra) Long Range Laser scan engines support Laser and Aiming modes only.

5.7.1 General

To enable barcode decoding capability in the system, the first thing is that the scanner port must be initialized by calling **ENABLE READER()**. After the scanner port is initialized, call **ON READER(1) GOSUB** to trigger the barcode decoding event.

- For CCD or Laser scan engine, the barcode decoding routines consist of 5 functions: **ENABLE READER(),GET_READER_DATA$()**, **DISABLE READER()**, **OFF READER(1)**, **ON READER(1) GOSUB**.
- For 2D or (Extra) Long Range Laser scan engine, it is necessary to enable new settings by calling **READER_CONFIG()** before decoding.

Note: (1) When 2D barcode data exceeds 255 bytes, it cannot be received completely in a string. You need to repeatedly call GET_READER_DATA$() to receive data until there is no data left out. (2) Because the length of each record in the DBF file is limited to 250 bytes, this index sequential file structure cannot be applied when dealing with 2D data that is longer than 250 bytes.

DISABLE READER

Purpose To disable the reader ports of the terminal.

Syntax DISABLE READER(***N%***)

Remarks "***N%***" is an integer variable, indicating the reader port; it is 1 for portable terminals.

Example DISABLE READER(1)

See Also ENABLE READER, GET_READER_DATA$

ENABLE READER

Purpose To enable the reader ports of the terminal.

Syntax ENABLE READER(***N%***)

Remarks "***N%***" is an integer variable, indicating the reader port; it is 1 for portable terminals.

The reader ports are disabled by default. To enable barcode decoding function, the reader ports have to be enabled by ENABLE READER.

Example

```
  ENABLE READER(1)
  ON READER(1) GOSUB Bcr_1
  ...
Bcr_1:
  Data$ = GET_READER_DATA$(1)
  RETURN
```

See Also DISABLE READER, GET_READER_DATA$, OFF READER, ON READER GOSUB..., READER_CONFIG, READER_SETTING

GET_READER_DATA$

Purpose To get data that is read from a specified reader port.

Syntax ***A$*** = GET_READER_DATA$(***N%***)

Remarks Usually, ON READER GOSUB... is used to trap the event that data is transmitted to the terminal through the reader port, and then GET_READER_DATA$ is used in a subroutine to get the reader data.

"***A$***" is a string variable to be assigned to the result.

"***N%***" is an integer variable, indicating the reader port; it is 1 for portable terminals.

Example

```
  ENABLE READER(1)
  ON READER(1) GOSUB Bcr_1
  ...
Bcr_1:
  Data$ = GET_READER_DATA$(1)
  RETURN
```

See Also DISABLE READER, ENABLE_READER, OFF READER, ON READER GOSUB...

READER_CONFIG 8300, 8500

Purpose To enable new settings on the scan engine after calling READER_SETTING().

Syntax READER_CONFIG

Remarks For new reader settings to take effect on any of the following readers, it is necessary to call this routine.

- 2D scan engine (8500 only)
- Long Range Laser scan engine (8300/8500)
- Extra Long Range Laser scan engine (8500 only)

Example See sample code below.

See Also ENABLE_READER, READER_SETTING

Sample Code

```
      READER_SETTING(5,0)
      READER_SETTING(132,0)
      READER_CONFIG                 ' enable the new settings for 2D
                                    ' or Long Range Laser engines
      ENABLE READER(1)              ' enable the reader
      ON READER(1) GOSUB G_Reader_Data
      CLS
      GOSUB MainScreen

MainLoop:
      Data$ = GET_READER_DATA$(1)
      IF LEN(Data$) <> 0 THEN       ' check if there are valid data
            GOSUB MainScreen
      END IF
      WAIT(10)                      ' for power saving
      GOTO MainLoop

MainScreen:
      CLS
      CodeLEN% = LEN(Data$)
      PRINT " Reader Testing"
      PRINT "CODE TYPE:"
      PRINT CodeType$
      PRINT "Code Length:", CodeLEN%
      PRINT "Count:", Count%
      PRINT "Data:", Data$

GetMoreData:
      Data$ = GET_READER_DATA$(1)   ' check if there are more data
      IF LEN(Data$) <> 0 THEN       ' if yes, meaning totally the
                                    ' data is longer than 255 bytes
                                    ' (must be 2D code)
            CodeLEN% = CodeLEN%+LEN(Data$)
            PRINT Data$
            GOTO GetMoreData
      END IF

      LOCATE 4,1
      PRINT "Code Length:", CodeLEN%

      RETURN

G_Reader_Data:
      BEEP(4000,8)
      Count% = Count% + 1
      IF CODE_TYPE = 65 THEN
            CodeType$ = "Code 39"
      ELSE IF CODE_TYPE = 66 THEN
            CodeType$ = "Italian Pharmacode"
      ELSE IF CODE_TYPE = 67 THEN
            CodeType$ = "CIP 39"
      ELSE IF CODE_TYPE = 68 THEN
            CodeType$ = "Industrial 25"
```

```
ELSE IF CODE_TYPE = 69 THEN
      CodeType$ = "Interleave 25"
ELSE IF CODE_TYPE = 70 THEN
      CodeType$ = "Matrix 25"
ELSE IF CODE_TYPE = 71 THEN
      CodeType$ = "Codabar"
ELSE IF CODE_TYPE = 72 THEN
      CodeType$ = "Code 93"
ELSE IF CODE_TYPE = 73 THEN
      CodeType$ = "Code 128"
ELSE IF CODE_TYPE = 74 THEN
      CodeType$ = "UPCE"
ELSE IF CODE_TYPE = 75 THEN
      CodeType$ = "UPCE with Addon 2"
ELSE IF CODE_TYPE = 76 THEN
      CodeType$ = "UPCE with Addon 5"
ELSE IF CODE_TYPE = 77 THEN
      CodeType$ = "EAN 8"
ELSE IF CODE_TYPE = 78 THEN
      CodeType$ = "EAN 8 with Addon 2"
ELSE IF CODE_TYPE = 79 THEN
      CodeType$ = "EAN 8 with Addon 5"
ELSE IF CODE_TYPE = 80 THEN
      CodeType$ = "EAN13"
ELSE IF CODE_TYPE = 81 THEN
      CodeType$ = "EAN13 with Addon 2"
ELSE IF CODE_TYPE = 82 THEN
      CodeType$ = "EAN13 with Addon 5"
ELSE IF CODE_TYPE = 83 THEN
      CodeType$ = "MSI"
ELSE IF CODE_TYPE = 84 THEN
      CodeType$ = "Plessey"
ELSE IF CODE_TYPE = 85 THEN
      CodeType$ = "EAN 128"
ELSE IF CODE_TYPE = 87 THEN
      CodeType$ = "GTIN"
ELSE IF CODE_TYPE = 90 THEN
      CodeType$ = "Telepen"
ELSE IF CODE_TYPE = 91 THEN
      CodeType$ = "RSS"
END IF
RETURN
```

5.7.2 Code Type

The following tables list the values of the **CodeType** variable.

Symbology Mapping Table I

Code Type	Symbology	Supported by Scan Engine
65 (A)	Code 39	CCD, Laser
66 (B)	Italian Pharmacode	CCD, Laser
67 (C)	CIP 39 (= French Pharmacode)	CCD, Laser
68 (D)	Industrial 25	CCD, Laser
69 (E)	Interleaved 25	CCD, Laser
70 (F)	Matrix 25	CCD, Laser
71 (G)	Codabar (NW7)	CCD, Laser
72 (H)	Code 93	CCD, Laser
73 (I)	Code 128	CCD, Laser
74 (J)	UPC-E0 / UPC-E1	CCD, Laser
75 (K)	UPC-E with Addon 2	CCD, Laser
76 (L)	UPC-E with Addon 5	CCD, Laser
77 (M)	EAN-8	CCD, Laser
78 (N)	EAN-8 with Addon 2	CCD, Laser
79 (O)	EAN-8 with Addon 5	CCD, Laser
80 (P)	EAN-13 / UPC-A	CCD, Laser
81 (Q)	EAN-13 with Addon 2	CCD, Laser
82 (R)	EAN-13 with Addon 5	CCD, Laser
83 (S)	MSI	CCD, Laser
84 (T)	Plessey	CCD, Laser
85 (U)	EAN-128	CCD, Laser
86 (V)	Reserved	---
87 (W)	Reserved	---
88 (X)	Reserved	---
89 (Y)	Reserved	---
90 (Z)	Telepen	CCD, Laser

91 ([ )	RSS-14	CCD, Laser
92 (\ )	Reserved	---
93 ( ])	Reserved	---

Symbology Mapping Table II

Code Type	Symbology	Supported by Scan Engine
65 (A)	Code 39	2D, (Extra) Long Range Laser
66 (B)	Code 32 (= Italian Pharmacode)	2D, (Extra) Long Range Laser
67 (C)	N/A	---
68 (D)	N/A	---
69 (E)	Interleaved 25	2D, (Extra) Long Range Laser
70 (F)	N/A	---
71 (G)	Codabar (NW7)	2D, (Extra) Long Range Laser
72 (H)	Code 93	2D, (Extra) Long Range Laser
73 (I)	Code 128	2D, (Extra) Long Range Laser
74 (J)	UPC-E0	2D, (Extra) Long Range Laser
75 (K)	UPC-E with Addon 2	2D, (Extra) Long Range Laser
76 (L)	UPC-E with Addon 5	2D, (Extra) Long Range Laser
77 (M)	EAN-8	2D, (Extra) Long Range Laser
78 (N)	EAN-8 with Addon 2	2D, (Extra) Long Range Laser
79 (O)	EAN-8 with Addon 5	2D, (Extra) Long Range Laser
80 (P)	EAN-13	2D, (Extra) Long Range Laser
81 (Q)	EAN-13 with Addon 2	2D, (Extra) Long Range Laser
82 (R)	EAN-13 with Addon 5	2D, (Extra) Long Range Laser
83 (S)	MSI	2D, (Extra) Long Range Laser
84 (T)	N/A	---
85 (U)	EAN-128	2D, (Extra) Long Range Laser
86 (V)	Reserved	---
87 (W)	Reserved	---
88 (X)	Reserved	---
89 (Y)	Reserved	---
90 (Z)	Reserved	---
91 ([ )	RSS-14	2D, (Extra) Long Range Laser

92 (\ )	RSS Limited	2D, (Extra) Long Range Laser
93 ( ])	RSS Expanded	2D, (Extra) Long Range Laser
94 (^)	UPC-A	2D, (Extra) Long Range Laser
95 (_)	UPC-A Addon 2	2D, (Extra) Long Range Laser
96 (')	UPC-A Addon 5	2D, (Extra) Long Range Laser
97 (a)	UPC-E1	2D, (Extra) Long Range Laser
98 (b)	UPC-E1 Addon 2	2D, (Extra) Long Range Laser
99 (c)	UPC-E1 Addon 5	2D, (Extra) Long Range Laser
100 (d)	TLC-39 (TCIF Linked Code 39)	2D
101 (e)	Trioptic (Code 39)	2D, (Extra) Long Range Laser
102 (f)	Bookland (EAN)	2D, (Extra) Long Range Laser
103 (g)	Code 11	2D
104 (h)	Code 39 Full ASCII	2D, (Extra) Long Range Laser
105 (i)	IATA* (25)	2D, (Extra) Long Range Laser
106 (j)	Discrete 25 (= Industrial 25)	2D, (Extra) Long Range Laser
107 (k)	PDF417	2D
108 (l)	MicroPDF417	2D
109 (m)	Data Matrix	2D
110 (n)	Maxicode	2D
111 (o)	QR Code	2D
112 (p)	US Postnet	2D
113 (q)	US Planet	2D
114 (r)	UK Postal	2D
115 (s)	Japan Postal	2D
116 (t)	Australian Postal	2D
117 (u)	Dutch Postal	2D
118 (v)	Composite Code	2D
119 (w)	Macro PDF417	2D
120 (x)	Macro MicroPDF417	2D

Note: IATA stands for International Air Transport Association, and this barcode type is used on flight tickets.

CODE_TYPE

Purpose To get the type of symbology being decoded upon a successful scan.

Syntax *A%* = CODE_TYPE

Remarks "*A%*" is an integer variable to be assigned to the result.

Refer to the above table for code types.

Example

```
...
CheckCodeType:
   IF CODE_TYPE = 65 THEN
      BcrType$ = "Code 39"
   ELSE IF CODE_TYPE = 66 THEN
      BcrType$ = "Italian Pharmacode"
...
END IF
PRINT "Code Type:", BcrType$
RETURN
```

See Also GET_READER_SETTING, READER_SETTING

5.7.3 Reader Settings

Refer to Appendix I for two tables that describe the details of the reader settings.

- Table I is for the use of CCD or Laser scan engine.
- Table II is for the use of 2D or (Extra) Long Range Laser scan engine.

Note: For 2D or (Extra) Long Range Laser scan engine, it is necessary to call READER_CONFIG() to enable new settings.

For specific symbology parameters, refer to Appendix II.

For scanner parameters, refer to Appendix III.

GET_READER_SETTING

Purpose To get the value of a specified parameter of the barcode settings.

Syntax ***A%*** = GET_READER_SETTING(***N%***)

Remarks "***A%***" is an integer variable to be assigned to the result.

"***N%***" is an integer variable, indicating the index number of a parameter. (cf. READER_SETTING)

Example

```
Setting1% = GET_READER_SETTING(1)
IF Setting1% = 1 THEN
   PRINT "Code 39 readability is enabled."
ELSE
   PRINT "Code 39 readability is disabled."
END IF
```

See Also CODE_TYPE, READER_SETTING

READER_SETTING

Purpose To set the value of a specified parameter of the barcode settings.

Syntax READER_SETTING(***N1%, N2%***)

Remarks A set of parameters called barcode settings determines how the decoder will decode the barcode data. The initial values of the barcode settings are given by the Barcode Settings Window of the BASIC Compiler. User can reset the values by calling READER_SETTING in a BASIC program. Refer to Appendix I/II/III for details of the settings.

"***N1%***" is an integer variable, indicating the index number of a parameter.

"***N2%***" is an integer variable, indicating the value to be set to a parameter.

Example	READER_SETTING(1,1) ' Code 39 readability is enabled.
See Also	CODE_TYPE, GET_READER_SETTING, READER_CONFIG

5.8 RFID Reader Commands

For the 8300/8500 series, it provides an optional RFID reader that can coexist with the barcode reader, if there is any.

The RFID reader supports read/write operations depending on the tags. The supported labels include ISO 15693, Icode®, ISO 14443A, and ISO 14443B.

Note: Before programming, you should study the specifications of RFID tags.

Currently, the performance of some tags has been confirmed, and the results are listed below. (✓ for features supported)

Tag Type	UID only	Read Page	Write Page
TAG_ISO14443A			
Mifare Standard 1K	✓	✓	✓
Mifare Standard 4K	✓	✓	✓
Mifare Ultralight	✓	✓	✓
Mifare DESFire	✓	-	-
Mifare S50	✓	✓	✓
SLE44R35	✓	-	-
SLE66R35	✓	✓	✓
TAG_SR176			
SRIX 4K	✓	✓	✓
SR176	✓	✓	✓
TAG_ISO15693			
ICODE SLI	✓	✓	✓
SRF55V02P	✓	-	-
SRF55V02S	✓	-	-
SRF55V10P	✓	-	-
TI Tag-it HF-I	✓	✓	✓
ICODE			
ICODE	✓	✓	✓

Note: These are the results found with RFID module version 1.0; use **SYSTEM_INFORMATION$(9)** to find out version information.

5.8.1 Virtual COM

The algorithm for programming the RFID reader simply follows the commands related to COM ports. The virtual COM port for RFID is defined as COM4. Thus,

▪ OPEN_COM(4)	: enable the RFID module
▪ CLOSE_COM(4)	: disable the RFID module
▪ A$ = READ_COM$(4)	: read data from an RFID tag
▪ WRITE_COM(4)	: write data to an RFID tag

- ON COM (4) GOSUB... and OFF COM (4)

5.8.2 Data Format

Before reading and writing operations, the parameters of RFID must be specified.

The settings of format are described below.

Parameter		**Description**						
TagType&		Bit 31 ~ 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
		Reserved.	ISO 14443B	SR176	ISO 14443A	Icode	Tagit	ISO 15693
start%		Specify the starting byte of data for the read/write operation.						
MaxLen%	***Read:***	Specify the maximum data length (1~255). Set 0 so that it reads UID data only.						
	Write:	Reserved. (Any integer value is acceptable.)						

When an RFID tag is read, the data string includes Tag Type, UID, and Data. The data format for READ_COM$(4) is as follows.

Byte 1			**Byte 2 ~ 18**	**Byte 19 ~ xx**
Tag Type:	TAG_ISO15693	’V’	Tag UID (SN)	Data
	TAG_Tagit	’T’		
	TAG_Icode	’I’		
	TAG_MifareISO14443A	’M’		
	TAG_SR176	’S’		
	TAG_ISO14443B	’Z’		

SET_RFID_READ	**8300, 8500**

Purpose To set the reading parameters of RFID.

Syntax SET_RFID_READ(***TagType&***, ***start%***, ***MaxLen%***)

Remarks The RFID reader cannot read until the parameters are specified.

Example

```
SET_RFID_READ(1,0,20)          ' read tag type ISO 15693
...                            ' starting from byte 0 of data
...                            ' data length 20 bytes
A$ = READ_COM$(4)
```

See Also CLOSE_COM, OPEN_COM, READ_COM$, SET_RFID_WRITE, WRITE_COM

SET_RFID_WRITE	**8300, 8500**

Purpose To set the writing parameters of RFID.

Syntax SET_RFID_WRITE(***TagType&***, ***start%***, ***MaxLen%***)

Remarks The RFID reader cannot write until the parameters are specified.

Example

```
OPEN_COM(4)
SET_RFID_WRITE(63,6,32)         ' all supported tag types are enabled
...                             ' write starting from byte 6 of data
...                             ' any value for data length
WRITE_COM(4,W_STR$)
```

See Also CLOSE_COM, OPEN_COM, READ_COM$, SET_RFID_READ, WRITE_COM

5.8.3 RFID Authentication

GET_RFID_KEY	**8300, 8500**

Purpose To get the security key of some specific tags.

Syntax ***A$*** = GET_RFID_KEY(***TagType %***)

Remarks This function is used to get the security key for some specific tags, such as Mifare Standard 1K/4K and SLE66R35 tags.

"***A$***" is a string variable to be assigned to the result.

"***TagType%***" is an integer variable, indicating a specific tag type that the security key is applied to.

Example MKEY$ = GET_RFID_KEY(4) ' get the security key for MifareISO14443A tags

See Also SET_RFID_KEY

SET_RFID_KEY 8300, 8500

Purpose To set the security key of some specific tags.

Syntax SET_RFID_KEY(***TagType%***, ***KeyString$***, ***KeyType%***)

Remarks This function is used to set security key for some specific tags, such as Mifare Standard 1K/4K and SLE66R35 tags.

"***TagType%***" is an integer variable, indicating a specific tag type that the security key is applied to.

TagType%	Meaning
1	TAG_ISO15693
2	TAG_Tagit
3	TAG_Icode
4	TAG_MifareISO14443A
5	TAG_SR176
6	TAG_ISO14443B

"***KeyString$***" is a string variable, indicating the security key you set.

"***KeyType%***" is an integer variable, indicating a specific key type.

KeyType%	Meaning
1	KEYA (Key A)
2	KEYB (Key B)

Example SET_RFID_KEY(4, “111111111111”, 1) ' set security key (KEY A) for MifareISO14443A tags

See Also GET_RFID_KEY

5.9 Keyboard Wedge Commands

If equipped with keyboard wedge interface, the following portable terminals can send data to the host through the wedge interface by calling **SEND_WEDGE()**.

- 711 series
- 8300 series

Note: For other wedge application, refer to the comparison table in 5.9.3 Wedge Emulator.

SEND_WEDGE() is governed by a set of parameters called **WedgeSetting$**. The command **SET_WEDGE** is used to configure these parameters.

5.9.1 Definition of the WedgeSetting Array

WedgeSetting$ is a 3-element character array passed to **SET_WEDGE** to describe the characteristics of the keyboard wedge interface. In a BASIC program, **WedgeSetting$** can be defined as follows.

```
WedgeSetting$ = Wedge_1$ + Wedge_2$ + Wedge_3$
```

The functions of the parameters Wedge_1$, Wedge_2$, and Wedge_3$ are described in the following subsections.

Parameter	Bit	Description
Wedge_1$	7-0	KBD / Terminal Type
Wedge_2$	7	1: Enable capital lock auto-detection 0: Disable capital lock auto-detection
Wedge_2$	6	1: Capital lock on 0: Capital lock off
Wedge_2$	5	1: Ignore alphabets' case 0: Alphabets are case-sensitive
Wedge_2$	4-3	00: Normal 10: Digits are at lower position 11: Digits are at upper position
Wedge_2$	2-1	00: Normal 10: Capital lock keyboard 11: Shift lock keyboard

Wedge_2$	0	1: Use numeric keypad to transmit digits 0: Use alpha-numeric key to transmit digits
Wedge_3$	7-0	Inter-character delay

1st Element: KBD / Terminal Type

The first element determines which type of keyboard wedge is applied. The possible value is listed as follows.

Value	Terminal Type	Value	Terminal Type
0	Null (Data Not Transmitted)	21	PS55 002-81, 003-81
1	PCAT (US)	22	PS55 002-2, 003-2
2	PCAT (FR)	23	PS55 002-82, 003-82
3	PCAT (GR)	24	PS55 002-3, 003-3
4	PCAT (IT)	25	PS55 002-8A, 003-8A
5	PCAT (SV)	26	IBM 3477 TYPE 4
6	PCAT (NO)	27	PS2-30
7	PCAT (UK)	28	Memorex Telex 122 Keys
8	PCAT (BE)	29	PCXT
9	PCAT (SP)	30	IBM 5550
10	PCAT (PO)	31	NEC 5200
11	PS55 A01-1	32	NEC 9800
12	PS55 A01-2	33	DEC VT220, 320, 420
13	PS55 A01-3	34	Macintosh (ADB)
14	PS55 001-1	35	Hitachi Elles
15	PS55 001-81	36	Wyse Enhance KBD (US)
16	PS55 001-2	37	NEC Astra
17	PS55 001-82	38	Unisys TO-300
18	PS55 001-3	39	Televideo 965
19	PS55 001-8A	40	ADDS 1010
20	PS55 002-1, 003-1		

For example, if the terminal type is PCAT (US), then the first element of the **WedgeSetting$** can be defined as follows.

```
Wedge_1$ = CHR$(1)
```

2nd Element

Capital Lock Auto-Detection

- When "Capital Lock Auto-Detection" is enabled, the command **SEND_WEDGE** can automatically detect the capital lock status of keyboard when the keyboard type selected is PCAT (all available languages), PS2-30, PS55, or Memorex Telex. If this is the case, **SEND_WEDGE** will ignore the capital lock status setting and perform auto-detection when transmitting data.
- When "Capital Lock Auto-Detection" is disabled, **SEND_WEDGE** will transmit alphabets according to the setting of the capital lock status.
- If the keyboard type selected is not one among PCAT, PS2-30, PS55, and Memorex Telex, **SEND_WEDGE** will transmit the alphabets according to the setting of the capital lock status, even though the auto-detection setting is enabled.
- To enable "Capital Lock Auto-Detection", add 128 to the value of the second element of **WedgeSetting$** (Wedge_2$).

Capital Lock Status Setting

- In order to send alphabets with correct case (upper or lower case), the command **SEND_WEDGE** must know the capital lock status of keyboard when transmitting data. Incorrect capital lock setting will result in different letter case (for example, 'A' becomes 'a', and 'a' becomes 'A').
- To set "Capital Lock ON", add 64 to the value of the second element of **WedgeSetting$** (Wedge_2$).

Alphabets' Case

- The setting of this bit affects the way the command **SEND_WEDGE** transmits alphabets. **SEND_WEDGE** can transmit alphabets according to their original case (case-sensitive) or just ignore it. If ignoring case is selected, **SEND_WEDGE** will always transmit alphabets without adding shift key.
- To set "Ignore Alphabets Case", add 32 to the value of the second element of **WedgeSetting$** (Wedge_2$).

Digits' Position

- This setting can force the command **SEND_WEDGE** to treat the position of the digit keys on the keyboard differently. If this setting is set to upper, **SEND_WEDGE** will add shift key when transmitting digits. This setting will be effective only when the keyboard type selected is PCAT (all available language), PS2-30, PS55, or Memorex Telex. However, if the user chooses to send digits using numeric keypad, this setting is meaningless.
- To set "Lower Position", add 16 to the value of the second element of **WedgeSetting$** (Wedge_2$).
- To set "Upper Position", add 24 to the value of the second element of **WedgeSetting$** (Wedge_2$).

Shift / Capital Lock Keyboard
◆ This setting can force the command **SEND_WEDGE** to treat the keyboard type to be a shift lock keyboard or a capital lock keyboard. This setting will be effective only when the keyboard type selected is PCAT (all available languages), PS2-30, PS55, or Memorex Telex. ◆ To set "Capital Lock", add 4 to the value of the second element of **WedgeSetting$** (Wedge_2$). ◆ To set "Shift Lock", add 6 to the value of the second element of **WedgeSetting$** (Wedge_2$).
Digit Transmission
◆ This setting instructs the command **SEND_WEDGE** which group of keys is used to transmit digits, whether to use the digit keys on top of the alphabetic keys or use the digit keys on the numeric keypad. ◆ To set "Use Numeric Keypad to Transmit Digits", add 2 to the value of the second element of **WedgeSetting$** (Wedge_2$).

Note: DO NOT set “Digits’ Position” and “Shift/Capital Lock Keyboard” unless you are certain to do so.

3rd Element: Inter-Character Delay

A millisecond inter-character delay, in the range of 0 to 255, can be added before transmitting each character. This is used to provide some response time for PC to process keyboard input.

For example, to set the inter-character delay to be 10 millisecond, the third element of the **WedgeSetting$** can be defined as follows.

```
Wedge_3$ = CHR$(10)
```

5.9.2 Composition of Output String

The keyboard wedge character mapping is shown below. Each character in the output string is translated by this table when the command **SEND_WEDGE** transmits data.

	00	10	20	30	40	50	60	70	80
0		F2	SP	0	@	P	`	p	⓪
1	INS	F3	!	1	A	Q	a	q	①
2	DLT	F4	“	2	B	R	b	r	②
3	Home	F5	#	3	C	S	c	s	③
4	End	F6	$	4	D	T	d	t	④
5	Up	F7	%	5	E	U	e	u	⑤
6	Down	F8	&	6	F	V	f	v	⑥
7	Left	F9	‘	7	G	W	g	w	⑦
8	BS	F10	(	8	H	X	h	x	⑧
9	HT	F11	)	9	I	Y	i	y	⑨
A	LF	F12	*	:	J	Z	j	z	
B	Right	ESC	+	;	K	[	k	{	
C	PgUp	Exec	,	<	L	\	l	|	
D	CR	CR*	-	=	M	]	m	}	
E	PgDn		.	>	N	^	n	~	
F	F1		/	?	O	_	o	Dly	

Note: (1) Dly: Delay 100 millisecond (2) ⓪~⑨: Digits of numeric keypad
(3) CR*: Enter key on the numeric keypad

The command **SEND_WEDGE** not only can transmit simple characters as above, but also provides a way to transmit combination key status, or even direct scan codes. This is done by inserting some special command codes in the output string. A command code is a character whose value is between 0xC0 and 0xFF.

0xC0 : Indicates that the next character is to be treated as scan code. Transmit it as it is, no translation required.

0xC0 | 0x01 : Send next character with Shift key.

0xC0 | 0x02 : Send next character with Left Ctrl key.

0xC0 | 0x04 : Send next character with Left Alt key.

0xC0 | 0x08 : Send next character with Right Ctrl key.

0xC0 | 0x10 : Send next character with Right Alt key.

0xC0 | 0x20 : Clear all combination status key after sending the next character.

For example, to send [A] [Ctrl-Insert] [5] [scan code 0x29] [Tab] [2] [Shift-Ctrl-A] [B] [Alt-1] [Alt-2-Break] [Alt-1] [Alt-3], the following characters are inserted into the string supplied to the command **SEND_WEDGE**.

```
0x41, 0xC2, 0x01, 0x35, 0xC0, 0x29, 0x09, 0x32, 0xC3, 0x41, 0x42, 0xC4,
0x31
0xE4, 0x32, 0xC4, 0x31, 0xC4, 0x33
```

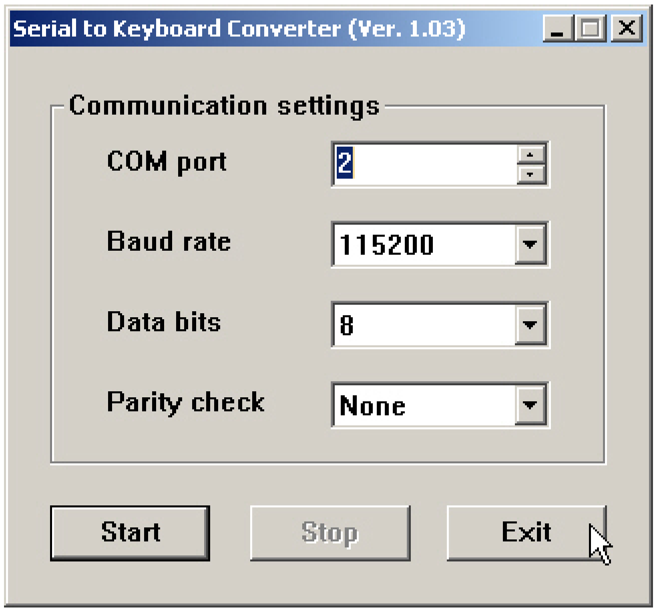
Note: (1) The scan code 0x29 is actually a space for PCAT, Alt-12 is a form feed character, and Alt-13 is an Enter.
(2) The break after Alt-12 is necessary, if omitted the characters will be treated as Alt-1213 instead of Alt-12 and Alt-13.

The following instructions can be called in the BASIC program to send the above string through the keyboard wedge interface.

```
...

Data_1$ = CHR$(65) + CHR$(194) + CHR$(1) + CHR$(53) + CHR$(192) +
CHR$(41)

Data_2$ = CHR$(9) + CHR$(50) + CHR$(195) + CHR$(65) + CHR$(66)

Data_3$ = CHR$(196) + CHR$(49) + CHR$(228) + CHR$(50) + CHR$(196) +
CHR$(49)

Data_4$ = CHR$(196) + CHR$(51)

DataString$ = Data_1$ + Data_2$ + Data_3$ + Data_4$

SEND_WEDGE (DataString$)

...
```

5.9.3 Wedge Emulator

CipherLab has developed the wedge emulator program “Serial to Keyboard Converter” for the 8000/8300/8500 series.



COM port: 2
Baud rate: 115200
Data bits: 8
Parity check: None

The “Serial to Keyboard Converter” program lets users convert data to keyboard input via IR/IrDA/RS-232 in general wedge functions, such as **SEND_WEDGE**, **SET_WEDGE**, and **WEDGE_READY**. This utility helps develop a keyboard key in application without any serial port input function. It supports multiple regions, i.e., an application can make use of this tool for varying keyboard layout.

Alternatively, you may apply Bluetooth SPP or HID for wedge applications on the Bluetooth-enabled terminals. Refer to section 5.20.6 Bluetooth for examples.

Wedge Options	Available Functions	Remarks
Keyboard Wedge Interface	WedgeSetting$ array, SEND_WEDGE, SET_WEDGE, WEDGE_READY	711/8300
Wedge Emulator via IR/IrDA/RS-232	OPEN_COM, SET_COM, SET_COM_TYPE, CLOSE_COM, SEND_WEDGE, SET_WEDGE, WEDGE_READY	8000/8300/8500
Wedge Emulator via Bluetooth SPP	SEND_WEDGE, SET_WEDGE, WEDGE_READY	8061/8360/8500
Bluetooth HID	WedgeSetting$ array, OPEN_COM, SET_COM, SET_COM_TYPE, CLOSE_COM, GET_NET_STATUS, WRITE_COM	8061/8360/8500

SEND_WEDGE

Purpose To send data to the host via keyboard wedge interface.

Syntax SEND_WEDGE(***DataString$***)

Remarks "***DataString$***" is the data string to be sent via the keyboard wedge interface.

Example

```
...
DataString$ = CHR$(9) + "TESTING" +            ' [Tab] + "TESTING" + [Tab]
CHR(9)
SEND_WEDGE (DataString$)
...
```

See Also SET_WEDGE, WEDGE_READY

SET_WEDGE

Purpose To configure the keyboard wedge interface.

Syntax SET_WEDGE(***WedgeSetting$***)

Remarks "***WedgeSetting$***" is a 3-element character array describing the characteristics of the keyboard wedge interface.

Example

```
...
Wedge_1$ = CHR$(1)                      ' terminal type: PCAT(US)
Wedge_2$ = CHR$(1)
' auto-detection disabled, capital lock off, case-sensitive
' use numeric keypad to transmit digits
Wedge_3$ = CHR$(5)                      ' inter-char-delay: 5 ms
WedgeSetting$ = Wedge_1$ + Wedge_2$ + Wedge_3$
SET_WEDGE(WedgeSetting$)
SEND_WEDGE (DataString$)
...
```

See Also SEND_WEDGE, WEDGE_READY

WEDGE_READY

Purpose To check if the keyboard wedge cable is well connected and ready to send data.

Syntax ***state%*** = WEDGE_READY

Remarks "***state%***" is an integer variable to be assigned to the result.

state%	Meaning
0	Not ready
1	Ready

Note that it takes approximately 110 ms to detect the status of the keyboard wedge connection. Therefore, for continuous and fast data transmission, simply call this function once. DO NOT call this function repeatedly.

Example

```
IF (WEDGE_READY = 1) THEN
   ...
   SEND_WEDGE (DATA$)
   ...
END IF
```

See Also SEND_WEDGE, SET_WEDGE

5.10 Buzzer Commands

This section describes the commands related to the buzzer.

BEEP

Purpose To specify a beep sequence of how a buzzer works.

Syntax BEEP(***freq%***, ***duration%*** {, ***freq%***, ***duration%***})

Remarks "***freq%***" is an integer variable, indicating the value of beep frequency (Hz).

Suggested frequency for the buzzer ranges from 1 kHz to 6 kHz.

"***duration%***" is an integer variable, indicating the value of beep duration, which is specified in units of 10 milliseconds.

Up to eight frequency-duration pairs can be assigned in a beep sequence. If the value of the frequency is 0, the buzzer will not sound during the time duration.

Example

```
  ON READER(1) GOSUB BcrDATA_1
  ...
BcrData_1:
  BEEP(2000, 10, 0, 10, 2000, 10)
  ...
  RETURN
```

See Also STOP BEEP

STOP BEEP

Purpose To terminate the beep sequence.

Syntax STOP BEEP

Remarks The STOP BEEP statement terminates the beep immediately if there is a beep sequence in progress.

Example

```
  BEEP(2000,0)
  ON KEY(1) GOSUB StopBeep
  PRINT "Press F1 to stop the buzzer."
  ...
StopBeep:
  STOP BEEP
  RETURN
```

See Also BEEP

5.11 Vibrator Commands

This section describes the command related to the vibrator. This function is currently supported on the 8300/8500 series.

Note: For the 8300 series, the hardware version must be 4.

VIBRATOR 8300, 8500

Purpose To set the vibrator.

Syntax VIBRATOR(***mode%***)

Remarks "***mode%***" is an integer variable, indicating the state of the vibrator.

mode%	Meaning
0	Off
1	On

Once the vibrator is enabled by VIBRATOR(1), the terminal will start vibrating until the vibrator is set off by VIBRATOR(0).

Example

```
VIBRATOR(1)                          ' turn on the vibrator
```

5.12 Calendar and Timer Commands

This section describes the commands related to the calendar and timer. The system date and time are maintained by the calendar chip, and they can be retrieved from or set to the calendar chip by the commands **DATE$** and **TIME$**. A backup rechargeable battery keeps the calendar chip running even when the power is turned off.

Commands for triggering the HOUR_SHARP event, the MINUTE_SHARP event, and the TIMER event: **OFF HOUR_SHARP**, **OFF MINUTE_SHARP**, **OFF TIMER**, **ON HOUR_SHARP GOSUB...**, **ON MINUTE_SHARP GOSUB...**, and **ON TIMER GOSUB...**

Up to five timers can be set by the command **ON TIMER... GOSUB...** for the "TIMER Event Trigger".

Note: The system time variable TIMER is maintained by CPU timers and has nothing to do with this calendar chip. Accuracy of this time variable depends on the CPU clock and is not suitable for precise time manipulation. Besides, it is reset to 0 upon powering up (as a cold start).

DATE$

Purpose To set or to get the current date.

Syntax DATE$ = ***X$***

***Y$*** = DATE$

Remarks DATE$ = ***X$***, to set the current date.

"***X$***" is a string variable in the form of "yyyymmdd".

***Y$*** = DATE$, to get the current date, in the form of "yyyymmdd".

"***Y$***" is a string variable to be assigned to the result.

Note that the BASIC Compiler and its Run-time Engines do not check the format and contents of the string to be assigned to DATE$. User is obliged to check the format and contents.

Example

```
DATE$ = "20000103"          ' set the system date to 2000/01/03
Today$ = DATE$              ' assign the current date to Today$
PRINT Today$                ' Today$ = "20000103"
...
```

See Also DAY_OF_WEEK, TIME$

DAY_OF_WEEK

Purpose To get the day of the week.

Syntax ***A%*** = DAY_OF_WEEK

Remarks "***A%***" is an integer variable to be assigned to the result.

A value of 1 to 7 represents Monday to Sunday respectively.

Example

```
  ON DAY_OF_WEEK GOSUB 100, 200, 300, 400, 500, 600, 700
  ...
100
  PRINT "Today is Monday."
  RETURN
200
  PRINT "Today is Tuesday."
  RETURN
300
  PRINT "Today is Wednesday."
  RETURN
  ...
```

See Also DATE$, TIME$

TIME$

Purpose To set or to get the current time.

Syntax TIME$ = ***X$***

***Y$*** = TIME$

Remarks TIME$ = ***X$***, to set the current time.

"***X$***" is a string variable in the form of "hhmmss".

***Y$*** = TIME$, to get the current time, in the form of "hhmmss".

"***Y$***" is a string variable to be assigned to the result.

The BASIC Compiler and its Run-time Engines do not check the format and contents of the string to be assigned to TIME$. User is obliged to check the format and contents.

Example

```
TIME$ = "112500"            ' set the system time to 11:25:00
CurrentTime$ = TIME$        ' assign the current to CurrentTime$
PRINT CurrentTime$          ' CurrentTime$ = "112500"
...
```

See Also DATE$, DAY_OF_WEEK

TIMER

Purpose To return the number of seconds elapsed since the terminal is powered on.

Syntax ***A&*** = TIMER

Remarks "***A&***" is a long integer variable to be assigned to the result.

Note that the TIMER is a read-only function. The system timer cannot be set by this command.

Example

```
  StartTime& = TIMER
  ...
Loop:
  IF EndTime& <> TIMER THEN
    EndTime& = TIMER
    TimerElapsed& = EndTime& - StartTime&
    CLS
    PRINT TimerElapsed&
    IF TimerElapsed& > 100 THEN GOTO NextStep
  END IF
  GOTO Loop
NextStep:
  ...
```

See Also OFF TIMER, ON TIMER GOSUB...

WAIT

Purpose To put the system on hold for a specified duration. In the interval, the system will be running in a rather low power consumption mode.

Syntax WAIT(***duration%***)

Remarks "***duration%***" is a positive integer variable, indicating the time duration for a hold. This argument is specified in units of 5 milliseconds.

When the application is waiting for events in a loop, the power consumption will be dramatically reduced by calling this function.

Note that WAIT is more efficient than CHANGE_SPEED.

Example

```
PRINT "CipherLab BASIC"
WAIT (200)                          ' the system is on hold for 1 second
```

See Also CHANGE_SPEED

5.13 LED Command

The LED can be used to indicate terminal status, for example, "Good Read" or "No Good" when scanning a barcode.

LED

Purpose To specify the LED lighting behavior.

Syntax LED(***number%***, ***mode%***, ***duration%***)

Remarks "***number%***" is a positive integer variable, indicating the LED color.

Value	Meaning
1	Red LED in use
2	Green LED in use

"***mode%***" is an integer variable, indicating the digital output mode. The values of the mode and their interpretation are listed below.

Value	Meaning
0	Turn off the LED for the specific duration and then turn on.
1	Turn on the LED for the specific duration and then turn off.
2	Flash the LED for a specific duration repeatedly. The flashing period equals ***2Xduration***.

"***duration%***" is an integer variable, specifying a period of time in units of 10 milliseconds. A value of 0 in this argument will keep the LED in the specific state indefinitely.

Example

```
   ON READER(1) GOSUB BcrData_1
   ...
BcrData_1:
   BEEP(2000,5)
   LED(2, 1, 5)                              ' GOOD READ LED for 520
   Data$ = GET_READER_DATA$(1)
   ...
```

5.14 Keypad Commands

All the CipherLab portable terminals provide a built-in keypad for data input. This section describes the commands related to the keypad operation.

Commands for triggering the ESC event and the KEY event: **OFF ESC**, **OFF KEY**, **ON ESC GOSUB...**, **ON KEY GOSUB...**

5.14.1 General

CLR_KBD

Purpose To clear the keyboard buffer.

Syntax CLR_KBD

Remarks By calling this function, data queuing in the keyboard buffer will be cleared.

Example

```
CLR_KBD
ON KEY(1) GOSUB KeyData_1
...
```

See Also INKEY$, PUTKEY

INKEY$

Purpose To read one character from the keyboard buffer and then remove it.

Syntax ***X$*** = INKEY$

Remarks "***X$***" is a string variable to be assigned to the character read.

It can be used with menu operation to detect a shortcut key being pressed, or with touch screen operation to detect a touched item.

Example

```
  ...
  PRINT "Initialize System (Y/N)?"
Loop:
  KeyData$ = INKEY$
  IF KeyData$ = "" THEN
    GOTO Loop
  ELSE IF KeyData$ = "Y" THEN
```

```
    GOTO Initialize
...
```

See Also CLR_KBD, PUTKEY

INPUT

Purpose To take user input from the keypad and store it in a variable.

Syntax INPUT ***variable***

Remarks "***variable***" is a numeric or string variable that will receive the input data. The data entered must match the data type of the variable.

When the input task is properly ended with the ENTER key being pressed, the data string will be stored in a variable. Otherwise, press the ESC key to abort the task, and the string will be cleared.

Example

```
INPUT String$                   ' input a string variable
PRINT String$
INPUT Number%                   ' input a numeric variable
PRINT Number%
```

INPUT_MODE

Purpose To set the display mode of the input data.

Syntax INPUT_MODE(***mode%***)

Remarks "***mode%***" is an integer variable, indicating the input mode.

mode%	Meaning
0	Nothing will be displayed on the LCD.
1	The input characters will be displayed on the LCD. (default)
2	"*" will be displayed instead of the input characters. Usually, it is applied for password input.

Example

```
LOCATE 1,1
INPUT_MODE(1)
INPUT Login$
LOCATE 2,1
INPUT_MODE(2)
INPUT Password$
```

KEY_CLICK

Purpose To enable/disable the key click sound.

Syntax KEY_CLICK(***status%***)

Remarks "***status%***" is an integer variable, indicating the key click status.

status%	Meaning	Applicable to Models
0	Disable (mute)	All
1	Enable	711, 8100
1 ~ 5	Each represents a different tone	8000, 8300, 8500

The key click is enabled by default.

Example KEY_CLICK(0) ' disable the key click

PUTKEY 8500

Purpose To put one character to the keyboard buffer.

Syntax PUTKEY(***N%***)

Remarks "***N%***" is an integer variable, indicating the ASCII code of a character.

It provides the capability of simulating the keypad operation. For example, it can be implemented with touch screen operation. The key value of a touched item, which is designed as a key on the screen by SET_SCREENITEMS, can be put to the keyboard buffer by using PUTKEY, and then be detected by using INKEY$.

Example PUTKEY(27) ' put [ESC] key value to the buffer

See Also CLR_KBD, INKEY$

5.14.2 ALPHA Key

By default, the input mode is numeric and can be modified by the ALPHA key. When the ALPHA key is pressed, it will take turns to show alphabet and numeric for the same keystroke. For example, the "2ABC" key can generate "2", "A", "B", and "C" by turns.

Note: For the 8500 series, the ALPHA key is available on the 24-key terminal only.

ALPHA_LOCK

Purpose To set the ALPHA state for input mode.

Syntax ALPHA_LOCK(***status%***)

Remarks "***status%***" is an integer variable, indicating the alpha-input status.

I	**status%**	**Default Input**	**ALPHA State**
711/8100	0	Numeric mode	Unlocked
711/8100	1	Alpha mode	Locked
711/8100	2	Numeric mode	Locked
II	**status%**	**Default Input**	**ALPHA State**
8000/8300/8500	0	Numeric mode	Unlocked
8000/8300/8500	1	Alpha mode, upper case	Unlocked
8000/8300/8500	2	Numeric mode	Locked
8000/8300/8500	3	Alpha mode, lower case	Unlocked
8000 only	4	Function mode	Unlocked
8000/8300/8500	5	Alpha mode, upper case	Locked
8000/8300/8500	6	Alpha mode, lower case	Locked
8000 only	7	Function mode	Locked

Example ALPHA_LOCK(1)

...

See Also GET_ALPHA_LOCK

GET_ALPHA_LOCK

Purpose To get information of the ALPHA state for input mode.

Syntax ***A%*** = GET_ALPHA_LOCK

Remarks "***A%***" is an integer variable to be assigned to the result.

Example Alpha_lock% = GET_ALPHA_LOCK

See Also ALPHA_LOCK

5.14.3 FN Key

The function (FN) key serves as a modifier key.

1. To enable this modifier key, press the function (FN) key on the keypad, and the status icon "F" will be displayed on the terminal screen.
2. Now press another key to get the value of key combination (say, F1), and then the status icon will go off. That is, this modifier key can work one time only.
3. To get the value of another key combination modified by the function (FN) key, repeat the above steps.

However, on condition that the function (FN) key is enabled and **FUNCTION_TOGGLE()** is called to lock it, this modifier key can work as many times as desired.

For the 8500 series, it offers two more options for **FUNCTION_TOGGLE()**, i.e. this modifier key can be treated as a general key and its key value be stored in a buffer.

FUNCTION_TOGGLE 8300, 8500

Purpose To set the state of the FN (function) toggle.

Syntax FUNCTION_TOGGLE(***status%***)

Remarks "***status%***" is an integer variable, indicating the state of the function toggle.

status%	Meaning
0	Unlocked (default)
1	Locked
2	Unlocked, with key value stored in keyboard buffer (8500 only)
3	Locked, with key value stored in keyboard buffer (8500 only)

Example

```
FUNCTION_TOGGLE(1)                    ' lock the function toggle
```

5.15 LCD Commands

The liquid crystal display (LCD) on the portable terminals is FSTN graphic display. For different models, it varies slightly in the display capability due to the size of LCD panel.

Model	**711, 8100, 8300**	**8000**	**8500**
Display Capability	128 x 64 dots	100 x 64 dots	160 x 160 dots
Top_Left	(0, 0)	(0, 0)	(0, 0)
Bottom_Right	(127, 63)	(99, 63)	(159, 159)

A coordinate system is used for the cursor movement routines to determine the cursor location, i.e. (x, y) indicates the column and row position of cursor. The coordinates given to the top left point is (1, 1), while those of the bottom right point depends on the size of LCD and font. For displaying a graphic, the coordinate system is on dot (pixel) basis.

5.15.1 Properties

- Contrast: Level 1 ~ 8. It is set to level 5 by default.
- Backlight: It is turned off by default. The shortcut key [FN] + [Enter] can be used as a toggle.

BACK_LIGHT_DURATION

Purpose To specify how long the backlight will last once the terminal is turned on.

Syntax BACK_LIGHT_DURATION(***N%***)

Remarks "***N%***" is an integer variable, indicating a period of time in units of 1 second.

Example BACK_LIGHT_DURATION(20) ' backlight lasts for 20 seconds

See Also BACKLIT, LCD_CONTRAST, SET_VIDEO_MODE

BACKLIT

Purpose To set the LCD backlight.

Syntax BACKLIT(***state%***)

Remarks "***state%***" is an integer variable, indicating a specific state (luminosity level) of the LCD backlight.

Model	state%	Meaning
711	0	BACKLIT_OFF
	1	BACKLIT_LO
	2	BACKLIT_MED
	3	BACKLIT_HI
8100/8000/8300	0	BACKLIT_OFF
	1	BACKLIT_LO
8500	0	BACKLIT_OFF
	1	BACKLIT_VERY_LO
	2	BACKLIT_LO
	3	BACKLIT_MED
	4	BACKLIT_HI

Example BACKLIT(1) ' turn on LCD backlight; at very low luminosity on 8500

See Also BACK_LIGHT_DURATION

LCD_CONTRAST

Purpose To set the contrast level of the LCD.

Syntax LCD_CONTRAST(***N%***)

Remarks "***N%***" is an integer variable, indicating the contrast level in the range of 1 to 8. The higher value, the stronger contrast.

Example LCD_CONTRAST(4) ' set the LCD contrast to level 4 (medium contrast)

See Also BACK_LIGHT_DURATION, SET_VIDEO_MODE

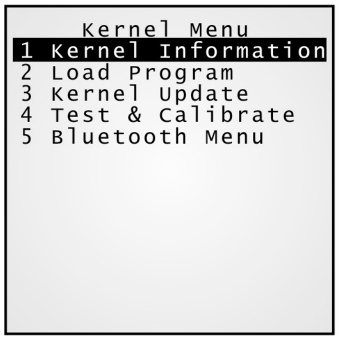
SET_VIDEO_MODE

Purpose To set the display mode of the LCD.

Syntax SET_VIDEO_MODE(***mode%***)

Remarks "***mode%***" is an integer variable, indicating the display mode.

mode%	Meaning
0	VIDEO_NORMAL
1	VIDEO_REVERSE


```
   Kernel Menu
1 Kernel Information
2 Load Program
3 Kernel Update
4 Test & Calibrate
5 Bluetooth Menu
```

SET_VIDEO_MODE(1);

Example SET_VIDEO_MODE(1) ' this string will be printed in reverse mode

PRINT "CipherLab terminals"

See Also BACK_LIGHT_DURATION, LCD_CONTRAST

5.15.2 Cursor

CURSOR

Purpose To turn on/off the cursor indication on the LCD.

Syntax CURSOR(***status%***)

Remarks "***status%***" is an integer variable, indicating the cursor status.

status%	Meaning
0	The cursor indication is off.
1	The cursor indication is on.

Example CURSOR(0)

See Also CURSOR_X, CURSOR_Y, LOCATE

CURSOR_X

Purpose To get the x coordinate of the current cursor position.

Syntax ***X%*** = CURSOR_X

Remarks "***X%***" is an integer variable to be assigned to the column position of the cursor.

Example

```
   ON READER(1) GOSUB BcrData_1
   ...
BcrData_1:
   BEEP(2000,5)
   Data$ = GET_READER_DATA$(1)
   Pre_X% = CURSOR_X
   Pre_Y% = CURSOR_Y
   Locate 8, 1
   PRINT Data$
   Locate Pre_Y%, Pre_X%
   RETURN
```

See Also CURSOR, CURSOR_Y, LOCATE

CURSOR_Y

Purpose To get the y coordinate of the current cursor position.

Syntax "***Y%***" = CURSOR_Y

Remarks "***Y%***" is an integer variable to be assigned to the row position of the cursor.

Example

```
  ON READER(1) GOSUB BcrData_1
  ...
BcrData_1:
  BEEP(2000,5)
  Data$ = GET_READER_DATA$(1)
  Pre_X% = CURSOR_X
  Pre_Y% = CURSOR_Y
  Locate 8, 1
  PRINT Data$
  Locate Pre_Y%, Pre_X%
  RETURN
```

See Also CURSOR, CURSOR_X, LOCATE

LOCATE

Purpose To move the cursor to a specified location on the LCD.

Syntax LOCATE ***row%***, ***col%***

Remarks "***row%***" is an integer variable, indicating the new row position of the cursor.

"***col%***" is an integer variable, indicating the new column position of the cursor.

Depending on the following elements, the maximum values for row and column are limited:

- The printing of characters in the icon area, which is determined by ICON_ZONE_PRINT().
- The size of LCD.
- The font file in use.

For the 8500 series, the y coordinate cannot be over 18 with font size 6x8 and ICON_ZONE_PRINT(0) is given.

Example

```
LOCATE 1,1                ' move the cursor to the top left of the LCD
```

See Also CURSOR, CURSOR_X, CURSOR_Y

5.15.3 Display

FILL_RECT

Purpose To fill a rectangular area on the LCD.

Syntax FILL_RECT(***x%***, ***y%***, ***size_x%***, ***size_y%***)

Remarks "***x%***", "***y%***" are integer variables, indicating the x, y coordinates of the upper left point of the rectangular area.

"***size_x%***" is an integer variable, indicating the width of the rectangle in pixels.

"***size_y%***" is an integer variable, indicating the height of the rectangle in pixels.

Example FILL_RECT(1,1,20,20)

See Also CLR_RECT

ICON_ZONE_PRINT

Purpose To enable or disable the printing of characters in the icon area.

Syntax ICON_ZONE_PRINT(***status%***)

Remarks "***status%***" an integer variable, indicating the printing status of the icon area.

status%	Meaning
0	The printing in the icon area is disabled (default).
1	The printing in the icon area is enabled.

The icon zone refers to an area on the LCD that is reserved for showing status icon, such as the battery icon, alpha icon, etc. By default, the icon zone cannot show characters and is accessed by graphic commands only.

- Display of 128x64 dots

  The icon zone occupies the right-most 8x64 dots. When ICON_ZONE_PRINT is enabled, the display can show up to 8 lines * 21 characters for 6x8 font, or 4 lines * 16 characters for 8x16 font.

- Display of 100x64 dots

  The icon zone occupies the right-most 4x64 dots. Yet, 4 pixels' width cannot hold one character. Therefore, even when ICON_ZONE_PRINT is enabled, the display remains to show up to 8 lines * 16 characters for 6x8 font, or 4 lines * 12 characters for 8x16 font.

- Display of 160x160 dots

  The icon zone occupies the bottom line, which may be 160x8 for 6x8 font or 160x16 for 8x16 font. When ICON_ZONE_PRINT is enabled, the display can show up to 19 lines * 26 characters for 6x8 font, or 9 lines * 20 characters for 8x16 font.

For any of the above displays, when ICON_ZONE_PRINT is enabled, the entire screen will be erased after calling CLS.

Note that the system may still show the status icons in this icon area, even though ICON_ZONE_PRINT is enabled. This is because these status icons are constantly maintained by the system, and they may override the printing of characters from time to time.

Example ICON_ZONE_PRINT(1) ' allow the printing of the icon area

See Also PRINT

PRINT

Purpose To display data on the LCD.

Syntax PRINT ***expression***[{,|;[***expression***]}]

Remarks "***expression***" may be numeric or string expression.

The position of each printed item is determined by the punctuation used to separate items in the list. In the list of expression, a comma causes the next character to be printed after the last character with a blank space. A semicolon causes the next character to be printed immediately after the last character. If the list of expressions terminates without a comma or semicolon, a carriage return is printed at the end of the line.

Example

```
LOCATE 1,1
PRINT String$(20,"")                ' clear the whole line
LOCATE 1,1
A = 5
PRINT A, "square is "; A*A
```

See Also CLS, ICON_ZONE_PRINT

WAIT_HOURGLASS 8000, 8300, 8500

Purpose To show a moving hourglass on the LCD.

Syntax WAIT_HOURGLASS(***x%, y%, type%***)

Remarks Call this function constantly to maintain its functionality. Five different patterns of an hourglass take turns to show on the LCD indicating the passage of time. The time factor is decided through programming but no less than two seconds.

"***x%***", "***y%***" are integer variables, indicating the x, y coordinates of the upper left point of a hourglass.

"***type%***" is an integer variable, indicating the size of a hourglass.

type%	Meaning
1	24 x 23 pixels

2	8 x 8 pixels

Example WAIT_HOURGLASS(68,68,1) ' show a 24 x 23 pixels hourglass at (68,68)

5.15.4 Clear

CLR_RECT

Purpose To clear a rectangular area on the LCD.

Syntax CLR_RECT(***x%***, ***y%***, ***size_x%***, ***size_y%***)

Remarks "***x%***", "***y%***" are integer variables, indicating the x, y coordinates of the upper left point of the rectangular area.

"***size_x%***" is an integer variable, indicating the width of the rectangle in pixels.

"***size_y%***" is an integer variable, indicating the height of the rectangle in pixels.

Example CLR_RECT(1,1,20,20)

See Also CLS, FILL_RECT

CLS

Purpose To clear everything on the LCD.

Syntax CLS

Remarks After running this command, whatever is being shown on the LCD will be erased and the cursor will be move to (1,1).

Example

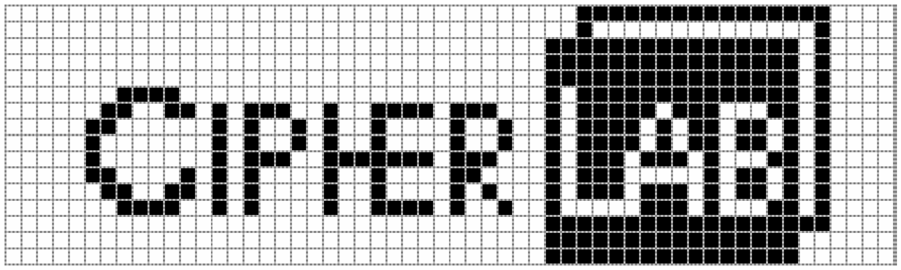
```
  ON TIMER(1,200) GOSUB ClearScreen          ' TIMER(1) = 2 second
  ...
ClearScreen:
  OFF TIMER(1)
  CLS
  RETURN
```

See Also CLR_RECT, PRINT

5.15.5 Image

The command **SHOW_IMAGE** can be used to display images on the LCD. User needs to allocate a string variable to store the bitmap data of the image. This string begins with the top row of pixels. Each row begins with the left-most pixels. Each bit of the bitmap represents a single pixel of the image. If the bit is set to 1, the pixel is marked, and if it is 0, the pixel is unmarked. The 1st pixel in each row is represented by the least significant bit of the 1st byte in each row. If the image is wider than 8 pixels, the 9th pixel in each row is represented by the least significant bit of the 2nd byte in each row.

The following is an example to show our company logo, and the string variable "icon$" is used for storing its bitmap data.



```
icon_1$=
chr$(0)+chr$(0)+chr$(0)+chr$(0)+chr$(248)+chr$(255)+chr$(7)

icon_2$= chr$(0)+chr$(0)+chr$(0)+chr$(0)+chr$(8)+chr$(0)+chr$(4)

icon_3$=

chr$(0)+chr$(0)+chr$(0)+chr$(0)+chr$(254)+chr$(255)+chr$(5)

icon_4$=
chr$(0)+chr$(0)+chr$(0)+chr$(0)+chr$(254)+chr$(255)+chr$(5)

icon_5$=
chr$(0)+chr$(0)+chr$(0)+chr$(0)+chr$(254)+chr$(255)+chr$(5)

icon_6$=
chr$(192)+chr$(3)+chr$(0)+chr$(0)+chr$(250)+chr$(255)+chr$(5)

icon_7$=
chr$(96)+chr$(214)+chr$(201)+chr$(59)+chr$(250)+chr$(142)+chr$(5)

icon_8$=
chr$(48)+chr$(80)+chr$(74)+chr$(72)+chr$(122)+chr$(109)+chr$(5)

icon_9$=
chr$(16)+chr$(80)+chr$(74)+chr$(72)+chr$(122)+chr$(109)+chr$(5)

icon_10$=
chr$(16)+chr$(208)+chr$(249)+chr$(59)+chr$(186)+chr$(139)+chr$(5)

icon_11$=
chr$(48)+chr$(84)+chr$(72)+chr$(24)+chr$(58)+chr$(104)+chr$(5)
```

```
icon_12$=
chr$(96)+chr$(86)+chr$(72)+chr$(40)+chr$(186)+chr$(107)+chr$(5)
icon_13$=
chr$(192)+chr$(83)+chr$(200)+chr$(75)+chr$(130)+chr$(139)+chr$(5)
icon_14$=
chr$(0)+chr$(0)+chr$(0)+chr$(0)+chr$(254)+chr$(255)+chr$(7)
icon_15$=
chr$(0)+chr$(0)+chr$(0)+chr$(0)+chr$(254)+chr$(255)+chr$(1)
icon_16$=
chr$(0)+chr$(0)+chr$(0)+chr$(0)+chr$(254)+chr$(255)+chr$(1)
show_image(2, 0, 56, 1, icon_1$)
show_image(2, 1, 56, 1, icon_2$)
show_image(2, 2, 56, 1, icon_3$)
show_image(2, 3, 56, 1, icon_4$)
show_image(2, 4, 56, 1, icon_5$)
show_image(2, 5, 56, 1, icon_6$)
show_image(2, 6, 56, 1, icon_7$)
show_image(2, 7, 56, 1, icon_8$)
show_image(2, 8, 56, 1, icon_9$)
show_image(2, 9, 56, 1, icon_10$)
show_image(2, 10, 56, 1, icon_11$)
show_image(2, 11, 56, 1, icon_12$)
show_image(2, 12, 56, 1, icon_13$)
show_image(2, 13, 56, 1, icon_14$)
show_image(2, 14, 56, 1, icon_15$)
show_image(2, 15, 56, 1, icon_16$)
…
```

GET_IMAGE

Purpose To read a bitmap pattern or capture signature from a rectangular area on the LCD.

Syntax ***DataCount%*** = GET_IMAGE(***file_index%, x%, y%, size_x%, size_y%***)

Remarks "***DataCount%***" is an integer variable to be assigned to the result; it is the total data count stored in the specified transaction file.

"***file_index%***" is an integer variable in the range of 1 to 6, indicating which transaction file is to store the bitmap data.

"***x%***", "***y%***" are integer variables, indicating the x, y coordinates of the upper left point of the rectangular area.

"***size_x%***" is an integer variable, indicating the width of the rectangle in pixels.

"***size_y%***" is an integer variable, indicating the height of the rectangle in pixels.

Example GET_IMAGE(3,12,32,60,16)

See Also GET_TRANSACTION_DATA$, GET_TRANSACTION_DATA_EX$, SET_SIGNAREA, SHOW_IMAGE

SHOW_IMAGE

Purpose To put a bitmap pattern to a rectangular area on the LCD.

Syntax SHOW_IMAGE(***x%***, ***y%***, ***size_x%***, ***size_y%***, ***image$***)

Remarks "***x%***", "***y%***" are integer variables, indicating the x, y coordinates of the upper left point of the rectangular area.

"***size_x%***" is an integer variable, indicating the width of the rectangle in pixels.

"***size_y%***" is an integer variable, indicating the height of the rectangle in pixels.

"***image$***" is a string variable, containing the bitmap data of the image.

Example icon$ = chr$(0)+chr$(0)+chr$(0)+chr$(0)+chr$(254)+chr$(255)+chr$(1)

show_image(2, 0, 56, 1, icon$)

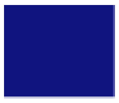
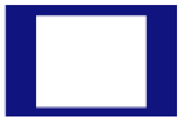
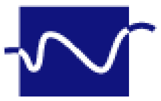
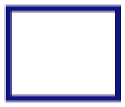
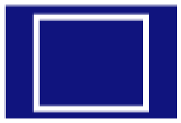
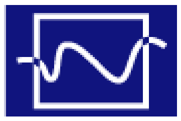
See Also GET_IMAGE

5.15.6 Graphics

Factors to Monochrome Graphics

A monochrome graphic has three factors:

Key Factor	**Functions**	**Parameter**	**Value**	**Meaning**
Video Display Mode	**SET_VIDEO_MODE**	mode%	0	Normal mode
			1	Reverse mode
Pixel State	**CIRCLE**	mode%	-1	DOT_REVERSE
	LINE		0	DOT_CLEAR
	PUT_PIXEL		1	DOT_MARK
	RECTANGLE			
Shape State	**CIRCLE**	type%	0	SHAPE_NORMAL
	RECTANGLE		1	SHAPE_FILL

Pixel State / Shape State	**DOT_MARK**	**DOT_CLEAR**	**DOT_REVERSE**
SHAPE_FILL			
SHAPE_NORMAL			

CIRCLE 8500

Purpose To draw a circle on the LCD.

Syntax CIRCLE(***cx%, cy%, r%, type%, mode%***)

Remarks "***cx%***", "***cy%***" are integer variables, indicating the x, y coordinates of the center of a circle.

"***r%***" is an integer variable, indicating the radius of a circle in pixels.

"***type%***" is an integer variable, indicating the type of a circle.

type%	**Meaning**
0	SHAPE_NORMAL (= hollow)
1	SHAPE_FILL (= solid)

"***mode%***" is an integer variable, indicating the state of a pixel.

mode%	Meaning
-1	DOT_REVERSE
0	DOT_CLEAR
1	DOT_MARK

Example CIRCLE(80,120,8,1,1) ' draw a solid circle centered at (8,120) with radius of 8 pixels

See Also CLS, LINE, PUT_PIXEL, RECTANGLE

LINE 8500

Purpose To draw a line on the LCD.

Syntax LINE(***x1%, y1%, x2%, y2%, mode%***)

Remarks "***x1%***", "***y1%***" are integer variables, indicating the x, y coordinates of where a line starts.

"***x2%***", "***y2%***" are integer variables, indicating the x, y coordinates of where a line ends.

"***mode%***" is an integer variable, indicating the state of a pixel.

mode%	Meaning
-1	DOT_REVERSE
0	DOT_CLEAR
1	DOT_MARK

Example LINE(10,10,120,10,1) ' draw a horizontal line

LINE(80,120,10,10,1) ' draw an oblique line

See Also CIRCLE, CLS, PUT_PIXEL, RECTANGLE

PUT_PIXEL 8500

Purpose To mark a pixel (or a dot) on the LCD.

Syntax PUT_PIXEL(***x%, y%, mode%***)

Remarks "***x%***", "***y%***" are integer variables, indicating the x, y coordinates of a pixel.

"***mode%***" is an integer variable, indicating the state of a pixel.

mode%	Meaning
-1	DOT_REVERSE
0	DOT_CLEAR

1	DOT_MARK

Example PUT_PIXEL(80,120,1) ' mark a pixel at (80,120)

See Also CIRCLE, CLS, LINE, RECTANGLE

RECTANGLE 8500

Purpose To draw a rectangle on the LCD.

Syntax RECTANGLE(***x1%, y1%, x2%, y2%, type%, mode%***)

Remarks "***x1%***", "***y1%***" are integer variables, indicating the x, y coordinates of where a diagonal starts.

"***x2%***", "***y2%***" are integer variables, indicating the x, y coordinates of where a diagonal ends.

"***type%***" is an integer variable, indicating the type of a circle.

type%	Meaning
0	SHAPE_NORMAL (= hollow)
1	SHAPE_FILL (= solid)

"***mode%***" is an integer variable, indicating the state of a pixel.

mode%	Meaning
-1	DOT_REVERSE
0	DOT_CLEAR
1	DOT_MARK

Example RECTANGLE(10,20,80,100,1,1) ' draw a rectangle

RECTANGLE(10,100,80,20,1,1) ' same rectangle as above

See Also CIRCLE, CLS, LINE, PUT_PIXEL

5.15.7 Fonts

Font Size

Basically, the portable terminals provide two size options for the system font: ***6x8*** and ***8x16***. The LCD will show ***6x8*** alphanumeric characters by default.

These options are also applicable to other alphanumerical font files (for single byte languages), such as the multi-language font file and Hebrew/Nordic/Polish/Russian font files.

In addition to the system font, the terminals support a number of font files as specified in section 2.1.2. Available font sizes depend on which font file is downloaded to the terminal.

	Font Files	**Custom Font Size**	**SetFont Options**
Single-byte	System font (default)	N/A	FONT_6X8, FONT_8X16
	Multi-language font file	N/A	FONT_6X8, FONT_8X16
	Others: He, Nd, Po, Ru	N/A	FONT_6X8, FONT_8X16
Double-byte	Tc, Sc, Jp, Kr	16X16	FONT_6X8, FONT_8X16
	Tc12, Sc12, Jp12, Kr12	True 12X12	FONT_6X12, FONT_12X12

Display Capability

Varying by the display size and the font size of alphanumerics, the display capability can be viewed by lines and characters as follows.

Model #	**Alphanumerical Font**	**Display Capability**		
	Size in dots	***Characters***	***Lines***	***Icon Area***
711, 8100, 8300	6x8	20 per line	8	Last column (8x64)
	8x16	15 per line	4	Last column (8x64)
8000	6x8	16 per line	8	Last column (4x64)
	8x16	12 per line	4	Last column (4x64)
8500	6x8	26 per line	19	Last row (160x8)
	8x16	20 per line	9	Last row (160x16)

Note: For the 8500 series, it can display up to 20 (or 10) lines when the icon area is not available for displaying the battery icon, etc. (i.e. ICON_ZONE_PRINT enabled)

Multi-language Font File

This font file may include English (default), French, Hebrew, Latin, Nordic, Portuguese, Turkish, Russian, Polish, Slavic, Slovak, etc. To display in any of these languages except English, you need to call **SET_LANGUAGE** to specify the language by region.

Special Font Files

Fonts with file name specifying Tc12 (Traditional Chinese), Sc12 (Simplified Chinese), Jp12 (Japanese), or Kr12 (Korean) are referred to as the special font files. This is because their font size for alphanumeric characters must be determined by **SELECT_FONT**, either ***6x12*** or ***12x12***. Otherwise, the characters cannot be displayed properly.

SELECT_FONT

Purpose To select a font size for the LCD to display alphanumeric characters properly.

Syntax SELECT_FONT(***font%***)

Remarks "***font%***" is an integer variable, indicating the font size.

font%	Meaning	
1	Font size 6x8	
2	Font size 8x16	
3	---	(Reserved)
4	Font size 6x12	(for font files Tc12, Sc12, Jp12, Kr12)
5	Font size 12x12	(for font files Tc12, Sc12, Jp12, Kr12)

- Single-byte Characters:

  For single-byte characters (system, multi-language, etc.), simply assign either 6X8 or 8X16.

- 16x16 double-byte Characters:

  You may assign 6x8 or 8x16 to display alphanumeric characters.

- 12x12 Double-byte Characters (for the 8000/8300/8500 series):

  If you assign 6x12, the font size for single byte characters will be 6x12, while it will still take 12x12 for double-byte characters (Tc12, Sc12, Jp12, Kr12). It thus provides flexibility in displaying alphanumeric.

  However, for Japanese Katakana, you have to assign 12x12; otherwise, the cursor position will be misplaced.

Example

```
SELECT_FONT(2)                     ' set font size 8x16
SELECT_FONT(4)                     ' set font size 6x12 for alphanumeric
SELECT_FONT(5)                     ' set font size 12x12 for alphanumeric
```

See Also GET_LANGUAGE, SET_LANGUAGE

5.16 Touch Screen Commands

For the 8500 series, the liquid crystal display (LCD) is also a touch screen when it is initialized by **ENABLE_TOUCHSCREEN**.

Commands for triggering the TOUCHSCREEN event: **OFF TOUCHSCREEN**, **ON TOUCHSCREEN GOSUB...**

Signature Capture

User may use the stylus to write anything directly on a specific area of the LCD, which is defined by **SET_SIGNAREA**. Then the signature can be captured by **GET_IMAGE**.

Touchable Items

Graphic items can be designed to simulate a key operation when being touched, e.g. a calculator. Patterns of the graphic items can be designed and displayed on the LCD by **SHOW_IMAGE**. Then, these items can be utilized and detected by **GET_SCREENITEM**.

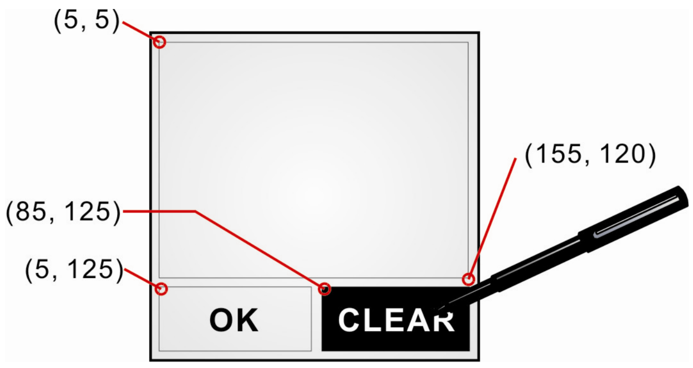
If the display mode for a selected item is set to ITEM_REVERSE by **SET_SCREENITEMS**, the item will be displayed in a reverse color once it is touched.

On the contrary, if it is set to ITEM_NORMAL, there will be no changes happening to the item once it is touched.

Example: Touch Screen Test

```
*** Signature Capture Area ***
' ENABLE_TOUCHSCREEN
SET_SIGNAREA(5, 5, 155, 120)
RECTANGLE(5, 5, 155, 120, 0, 1)

*********** Buttons ***********
RECTANGLE(5, 125, 75, 145, 0, 1)
RECTANGLE(85, 125, 155, 145, 0, 1)
ITEMSTR$= CHR$(5)+ CHR$(125)+CHR$(70)+CHR$(20)+CHR$(13)
ITEMSTR$= ITEMSTR$+CHR$(85)+ CHR$(125)+CHR$(70)+CHR$(20)
+CHR$(13)
```

```
SET_SCREENITEMS(1, 2, ITEMSTR$)
ON TOUCHSCREEN GOSUB GetTouch

GetTouch:
A%= GETSCREENITEM
IF A%=1 THEN
    PRINT "OK"
ELSE IF A%=2 THEN
    PRINT "CLEAR"
END IF
LOOP:
    GOTO LOOP
```



DISABLE_TOUCHSCREEN 8500

Purpose To disable the touch screen.

Syntax DISABLE_TOUCHSCREEN

Remarks To restart the touch screen function, ENABLE_TOUCHSCREEN must be called.

Example DISABLE_TOUCHSCREEN

See Also ENABLE_TOUCHSCREEN, GET_SCREENITEM, SET_SCREENITEMS, SET_SIGNAREA

ENABLE_TOUCHSCREEN 8500

Purpose To enable the touch screen.

Syntax ENABLE_TOUCHSCREEN

Remarks The touch screen won't work until it is initialized by this command.

Example ENABLE_TOUCHSCREEN

See Also DISABLE_TOUCHSCREEN, GET_SCREENITEM, OFF TOUCHSCREEN, ON TOUCHSCREEN GOSUB..., SET_SCREENITEMS, SET_SIGNAREA

GET_SCREENITEM 8500

Purpose To detect and return an item number when an item is selected.

Syntax ***A%*** = GET_SCREENITEM

Remarks "***A%***" is an integer variable assigned to the result.

This function has to be called constantly to maintain its functionality.

The number of a selected item will be returned.

When no item is detected, it will return 0.

Example TouchItem% = GET_SCREENITEM

See Also DISABLE_TOUCHSCREEN, ENABLE_TOUCHSCREEN, OFF TOUCHSCREEN, ON TOUCHSCREEN GOSUB..., SET_SCREENITEMS, SET_SIGNAREA

SET_SCREENITEMS 8500

Purpose To specify the size and display mode of the touchable items.

Syntax SET_SCREENITEMS(***mode%***, ***total_item%***, ***item$***)

Remarks The pattern of a touched item is designed by using the command SHOW_IMAGE. It may be a graphic icon, button or key.

"***mode%***" is an integer variable, indicating the display mode when an item is touched.

mode%	Meaning
0	ITEM_NORMAL (A touched item will be displayed normally.)
1	ITEM_REVERSE (A touched item will be displayed in a reverse color.)

"***total_item%***" is an integer variable, indicating the amount of items.

"***item$***" is a string variable, containing the size information of items.

User needs to allocate a string variable to store the size information of each item.

item$	Meaning
x%, y%	the x, y coordinates of the upper left point of an item
size_x%	the width of an item in pixels
size_y%	the height of an item in pixels

Example ITEMSTR$ = CHR$(5) + CHR$(125) + CHR$(70) + CHR$(20) + CHR$(13)

ITEMSTR$ = ITEMSTR$ + CHR$(85) + CHR$ (125) + CHR$(70) + CHR$(20) + CHR$(13)

SET_SCREENITEMS(1,2,ITEMSTR$)

See Also DISABLE_TOUCHSCREEN, ENABLE_TOUCHSCREEN, GET_SCREENITEM, OFF TOUCHSCREEN, ON TOUCHSCREEN GOSUB..., SET_SIGNAREA, SHOW_IMAGE

SET_SIGNAREA 8500

Purpose To define a signature capture area.

Syntax SET_SIGNAREA(***UppLeft_x%, UppLeft_y%, LowRight_x%, LowRight_y%***)

Remarks Once the signature capture area is defined, user may use the stylus to freely write or draw on the touch screen.

Note that signature capture is only valid when the writing doesn't exceed the specified area.

"***UppLeft_x%***" and "***UppLeft_y%***" are integer variables, indicating the x, y coordinates of the upper left point of an area.

"***LowRight_x%***" and "***LowRight_y%***" are integer variables, indicating the x, y coordinates of the lower right point of an area.

Example SET_SIGNAREA(8,8,150,100)

See Also DISABLE_TOUCHSCREEN, ENABLE_TOUCHSCREEN, GET_SCREENITEM, SET_SCREENITEMS, GET_IMAGE

5.17 Battery Commands

This section describes the commands related to the battery power.

BACKUP_BATTERY

Purpose To get the voltage level of the backup battery.

Syntax *A%* = BACKUP_BATTERY

Remarks "*A%*" is an integer variable to be assigned to the result. That is, the voltage level of the backup battery is returned in units of milli-volt (mV).

The backup battery is used to retain data in SRAM and keep the real-time clock and calendar running, even when the power is off. The backup battery would be considered as "Battery Low" when the BACK_BATTERY is lower than 2900 mV. That means the SRAM and the calendar chip may lose their data at any time thereafter, if the battery is not recharged or replaced.

Example

```
CheckBackupBattery:
  IF BACKUP_BATTERY < BATTERY_LOW% THEN
  BEEP(2000,30)
  CLS
  PRINT "Backup Battery needs to be replaced!"
  Loop:
    GOTO Loop
  END IF
```

See Also MAIN_BATTERY

MAIN_BATTERY

Purpose To get the voltage level of the main battery.

Syntax *A%* = MAIN_BATTERY

Remarks "*A%*" is an integer variable to be assigned to the result. That is, the voltage level of the main battery is returned in units of milli-volt (mV).

The main battery is the power source for the system operation. The main battery would be considered as "Battery Low" when the MAIN_BATTERY is lower than 3400 mV (or 2200 mV for alkaline battery on 8001). That means the basic operations may still be running, but some functions that consume high power may be disabled.

Example

```
  BATTERY_LOW% = 3400
CheckMainBattery:
  IF MAIN_BATTERY < BATTERY_LOW% THEN
  BEEP(2000,30)
  CLS
  PRINT "Main Battery needs to be recharged!"
  Loop:
    GOTO Loop
  END IF
```

See Also BACKUP_BATTERY

5.18 Communication Ports

There are at least two communication ports on each terminal, namely ***COM1*** and ***COM2***. Before using the COM ports, user has to call **SET_COM_TYPE** to specify which communication type is to be used: RS-232, Serial IR, IrDA, RF, Bluetooth (SPP/DUN/HID), or GSM.

Note: SET_COM_TYPE is not applicable to RFID (COM 4).

5.18.1 Port Mapping

The following table shows the mapping of the communication ports.

Model#	COM1	COM2	COM3	COM4
711	RS-232	Serial IR, IrDA	N/A	N/A
8000	Serial IR, IrDA	Acoustic Coupler, Bluetooth	N/A	N/A
8100	RS-232	RF	N/A	N/A
8300	RS-232, Serial IR, IrDA	RF, Bluetooth	N/A	N/A
8500	Serial IR, IrDA	Bluetooth	GSM	RFID

Note: The Bluetooth profiles supported on the 8000/8300/8500 series include SPP, DUN, and HID.

The same command set is provided for the above interface: **OPEN_COM**, **CLOSE_COM**, **READ_COM$**, and **WRITE_COM**

Commands for triggering the COM event: **OFF COM**, **ON COM GOSUB...**

5.18.2 Receive & Transmit Buffers

Receive Buffer

A 256 byte FIFO buffer is allocated for each port. The data successfully received is stored in this buffer sequentially (if any error occurs, e. g. framing, parity error, etc., the data is simply discarded). However, if the buffer is already full, the incoming data will be discarded and an overrun flag is set to indicate this error.

Transmit Buffer

The system does not allocate any transmit buffer. It simply records the pointer of the string to be sent. The transmission stops when a null character (0x00) is encountered. The application program must allocate its own transmit buffer and not to modify it during transmission.

The rest communication-related commands are grouped by different communication types and described separately in the following sections.

CLOSE_COM

Purpose To terminate communication and disable a specified COM port.

Syntax CLOSE_COM(***N%***)

Remarks "***N%***" is an integer variable, indicating which COM port is to be disabled.

Example CLOSE_COM(2)

See Also OPEN_COM, READ_COM$, SET_COM_TYPE, WRITE_COM

OPEN_COM

Purpose To enable a specified COM port and initialize communication.

Syntax OPEN_COM(***N%***)

Remarks "***N%***" is an integer variable, indicating which COM port is to be enabled.

Example OPEN_COM(1)

See Also CLOSE_COM, OFF COM, ON COM GOSUB..., READ_COM$, SET_COM_TYPE, WRITE_COM

READ_COM$

Purpose To read data from a specified COM port.

Syntax ***A$*** = READ_COM$(***N%***)

Remarks "***A$***" is a string variable to be assigned to the data.

"***N%***" is an integer variable, indicating from which COM port the data is to be read. If the receive buffer is empty, an empty string will be returned.

Example

```
ON COM(1) GOSUB HostCommand
...
```

```
HostCommand:
  Cmd$ = READ_COM$(1)
  CmdIdentifier$ = LEFT$(Cmd$,1)
  DBFNum% = VAL(MID$(Cmd$,2,1))
  IDFNum% = VAL(MID$(Cmd$,3,1))
  CardID$ = RIGHT$(Cmd$,LEN(Cmd$)-3)
  IF CmdIdentifier$ = "-" THEN
    DEL_RECORD(DBFNum%,IDFNum%)
  ELSE
    ...
```

See Also CLOSE_COM, OFF COM, ON COM GOSUB..., OPEN_COM, SET_COM_TYPE, WRITE_COM

SET_COM

Purpose To set parameters for a specified COM port.

Syntax SET_COM(***N%***, ***Baudrate%***, ***Parity%***, ***Data%***, ***Handshake%***)

Remarks This command needs to be called BEFORE opening a COM port. However, it is not necessary for RF, GSM, and RFID.

This command also serves Bluetooth configuration for SPP, DUN, HID, and Wedge.

Parameters	**Values**	**Remarks**
N%	1 or 2	Indicates which COM port is to be set.
Baudrate%	1: 115200 bps 2: 76800 bps* 3: 57600 bps 4: 38400 bps 5: 19200 bps 6: 9600 bps 7: 4800 bps* 8: 2400 bps*	Specifies the baud rate of the COM port. ◆ For acoustic coupler setting, 1 ~ 4 is used to indicate its volume (low to high).
	* (asterisk): Not applicable to Serial IR.	
Parity%	1: None 2: Odd 3: Even 4: Cradle commands	Specifies the parity of the COM port. Refer to Appendix VI for cradle commands.

Data%	1: 7 data bits 2: 8 data bits	Specifies the data bits of the COM port.
Handshake%	1: None 2: CTS/RTS 3: XON/XOFF 4: Wedge 5 ~ 9: 2 stop bits	◆ Specifies the method of flow control for direct RS-232. ◆ Set 1 for Serial IR or IrDA. ◆ For the 8000/8300 series, to disable Reserved Host Commands, add 16 to the value of Handshake%. (see table below) ◆ For the 8300 series, to enable URPower 5V, add 32 to the value of Handshake%. (see table below) ◆ For acoustic coupler, 5 ~ 9 is used to indicate the character delay for 2 stop bits. 5 for 0 character delay; 6 for 1 character delay; 7 for 3 characters delay; 8 for 5 characters delay; 9 for 10 characters delay.

Value	Handshake%	Reserved Host Commands	URPower 5V
1	None	Enabled	Disabled
17	(=1+16)	Disabled	Disabled
33	(=1+32)	Enabled	Enabled
49	(=1+16+32)	Disabled	Enabled
2...	CTS/RTS	Same options	Same options
3...	XON/XOFF	Same options	Same options
4...	Wedge Emulator	Same options	Same options

Example

```
SET_COM(1,1,1,2,1)  ' COM1, 115200, None, 8, No handshake
SET_COM(1,1,1,2,17) ' COM1, 115200, None, 8, No handshake, Reserved Host
                      Commands disabled
SET_COM(1,1,1,2,33) ' COM1, 115200, None, 8, No handshake, URPower 5V
                      enabled
SET_COM(1,1,1,2,49) ' COM1, 115200, None, 8, No handshake,Reserved Host
                      Commands disabled, URPower 5V enabled
```

See Also CLOSE_COM, OPEN_COM, READ_COM$, SET_COM_TYPE, WRITE_COM

SET_COM_TYPE

Purpose To assign the communication type to a specified COM port.

Syntax SET_COM_TYPE(***N%***, ***type%***)

Remarks "***N%***" is an integer variable, indicating which COM port (1~3) is to be set.

"***type%***" is an integer variable, indicating the type of interface.

type%	Meaning
1	Direct RS-232
2	N/A
3	Serial IR (via IR transceiver)
4	Standard IrDA
5	RF, Bluetooth (SPP/DUN/HID)
6	GSM_SMS
7	Acoustic Coupler (8000) or GSM_Modem (8500)

This function needs to be called BEFORE opening a COM port. However, it is not necessary for RFID. Note that the COM port mapping is different for each model of terminal, and a COM port may not support all the communication types.

Example

```
SET_COM_TYPE(1,3)          ' set COM1 of 8300 to serial IR
                           communication
```

See Also CLOSE_COM, OPEN_COM, READ_COM$, SET_COM, WRITE_COM

WRITE_COM

Purpose To send a string to the host through a specified COM port.

Syntax WRITE_COM(***N%***, ***A$***)

Remarks "***N%***" is an integer variable, indicating which COM port the data is to be sent to.

"***A$***" is a string variable, representing the string to be sent.

Example

```
   ON READER(1) GOSUB BcrData_1
   ...
BcrData_1:
   BEEP(2000,5)
   Data$ = GET_READER_DATA$(1)
   WRITE_COM(1, Data$)
   ...
```

See Also CLOSE_COM, OPEN_COM, READ_COM$, SET_COM_TYPE

5.18.3 RS-232, Serial IR and IrDA Communications

RS-232 Parameters	
Baud Rate:	115200, 76800, 57600, 38400, 19200, 9600, 4800, 2400
Data Bits:	7 or 8
Parity:	Even, Odd, or None
Stop Bit:	1
Flow Control:	RTS/CTS, XON/XOFF, or None
Serial IR Parameters	
Baud Rate:	115200, 57600, 38400, 19200, 9600
Data Bits:	8
Parity:	Even, Odd, or None
Stop Bit:	1
Flow Control:	None
IrDA Parameters	
Baud Rate:	115200, 76800, 57600, 38400, 19200, 9600, 4800, 2400
Data Bits:	7 or 8
Parity:	Even, Odd, or None
Stop Bit:	1
Flow Control:	None

Note: For IrDA settings, parameters are required for compatibility in coding. In fact, they are “don’t care” parameters.

COM_DELIMITER

Purpose To change delimiter of sending and receiving string for a specified COM port.

Syntax COM_DELIMITER(***N%***, ***C%***)

Remarks The default COM_DELIMITER is 0x0d.

"***N%***" is an integer variable, indicating which COM port is to be set.

"***C%***" is an integer variable, representing the ASCII code of the delimiter character, in the range of 0 to 255. If it is negative, no delimiter will be applied.

Example

```
COM_DELIMITER(1,13)          ' use RETURN as delimiter
COM_DELIMITER(1,10)          ' use Line Feed as delimiter
```

IRDA_STATUS 711, 8000, 8300, 8500

Purpose To check the IrDA connection status or transmission status.

Syntax ***A%*** = IRDA_STATUS(***N%***)

Remarks "***A%***" is an integer variable to be assigned to the result.

"***N%***" is an integer variable, indicating the action to take.

N%	Meaning
0	To check IrDA connection status. ◆ When A% = 0, it means the IrDA connection is disabled. ◆ When A% = 1, it means the IrDA connection is enabled.
1	To check whether data being transmitted successfully or not. ◆ A% is the length of string (delimiters are included).

Example

```
CLS
SET_COM_TYPE(2,4)                  ' set COM2 of 711 as IrDA port
OPEN_COM(2)

Loop1:
IF (IRDA_STATUS(0) = 1) THEN       ' check connection
   BEEP(4400,5)
ELSE
   GOTO Loop1
END IF

WRITE_COM(2, "My Data")
IF (IRDA_STATUS(1) = 7) THEN       ' check transmission
   PRINT "Write OK"
ELSE
   PRINT "Write NG"
END IF

CLOSE_COM(2)
```

See Also IRDA_TIMEOUT

IRDA_TIMEOUT 711, 8000, 8300, 8500

Purpose To set the timeout for IrDA connection.

Syntax IRDA_TIMEOUT(***N%***)

Remarks "***N%***" is an integer variable in the range of 1 to 8, indicating a specified period of time.

N%	Meaning
1	3 sec
2	8 sec
3	12 sec
4	16 sec
5	20 sec
6	25 sec
7	30 sec
8	40 sec

Example
```
IRDA_TIMEOUT(7)                    ' set timeout to 30 seconds
```

See Also IRDA_STATUS

Flow Control

To avoid data loss, three options of flow control are supported and done by background routines.

1. None: Flow control is disabled.
2. RTS/CTS: RTS now stands for ***Ready for Receiving*** instead of ***Request To Send***, while CTS for ***Clear To Send***. The two signals are used for hardware flow control.
   - Transmit

     Transmission is allowed only when the CTS signal is asserted. If the CTS signal is negated (= de-asserted) and later becomes asserted again, the transmission is automatically resumed by background routines. However, due to the UART design (on-chip temporary transmission buffer), up to five characters might be sent after the CTS signal is de-asserted.
   - Receive

     The RTS signal is used to indicate whether the storage of receive buffer is free or not. If the receive buffer cannot take more than 5 characters, the RTS signal is de-asserted, and it instructs the sending device to halt the transmission. When its receive buffer becomes enough for more than 15 characters, the RTS signal becomes asserted again, and it instructs the sending device to resume transmission.

As long as the buffer is sufficient (may be between 5 to 15 characters), the received data can be stored even though the RTS signal has just been negated.

3. XON/XOFF: Instead of using RTS/CTS signals, two special characters are used for software flow control, i.e. XON (hex 11) and XOFF (hex 13). XON is used to enable transmission while XOFF to disable transmission.

   - Transmit

     When the port is opened, the transmission is enabled. Then every character received is examined to see if it is normal data or flow control codes. If an XOFF is received, transmission is halted. It is resumed later when XON is received. Just like the RTS/CTS control, up to two characters might be sent after an XOFF is received.

   - Receive

     The received characters are examined to see if it is normal data (which will be stored to the receive buffer) or a flow control code (set/reset transmission flag but not stored). If the receive buffer cannot take more than 5 characters, an XOFF control code is sent. When the receive buffer becomes enough for more than 15 characters, an XON control code will be sent so that the transmission will be resumed. As long as the buffer is sufficient (may be between 5 to 15 characters), the received data can be stored even when in XOFF state.

     If receiving and transmitting are concurrently in operation, the XON/XOFF control codes might be inserted into normal transmit data string. When using this method, make sure that both sides feature the same control methodology; otherwise, dead lock might happen.

Note: Flow control is only applicable to the direct RS-232 COM port, which is usually assigned as COM 1.

GET_CTS 711, 8100, 8300

Purpose To get CTS level on the direct RS-232 port.

Syntax ***A%*** = GET_CTS(***N%***)

Remarks "***A%***" is an integer variable to be assigned to the result.

A%	Meaning
0	Negated (= in the "space" state)
1	Asserted (= in the "mark" state)

"***N%***" is an integer variable, indicating on which COM port to get CTS level.

Example A% = GET_CTS(1)

See Also SET_RTS

SET_RTS 711, 8100, 8300

Purpose To set RTS level on the direct RS-232 port.

Syntax SET_RTS(***N1%***, ***N2%***)

Remarks "***N1%***" is an integer variable, indicating on which COM port to set RTS level.

"***N2%***" is an integer variable, indicating the RTS state.

N2%	Meaning
0	Negated (= in the "space" state)
1	Asserted (= in the "mark" state)

Example

```
SET_RTS(1,1)                    ' set COM1 RTS to the "mark" state
```

See Also GET_CTS

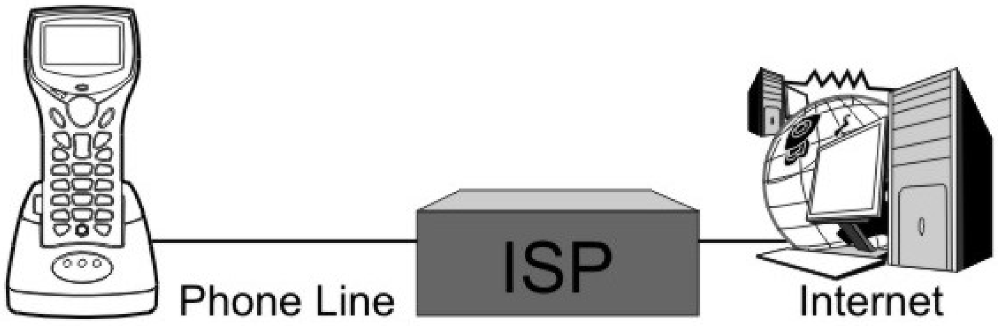
5.19 IR / RS-232 Networking

5.19.1 PPP via IR / RS-232

PPP, short for Point-to-Point Protocol, is a method of connecting a terminal to the Internet over serial links. PPP sends the computer's TCP/IP packets to a server that puts them onto the Internet.

PPP Connection via IR

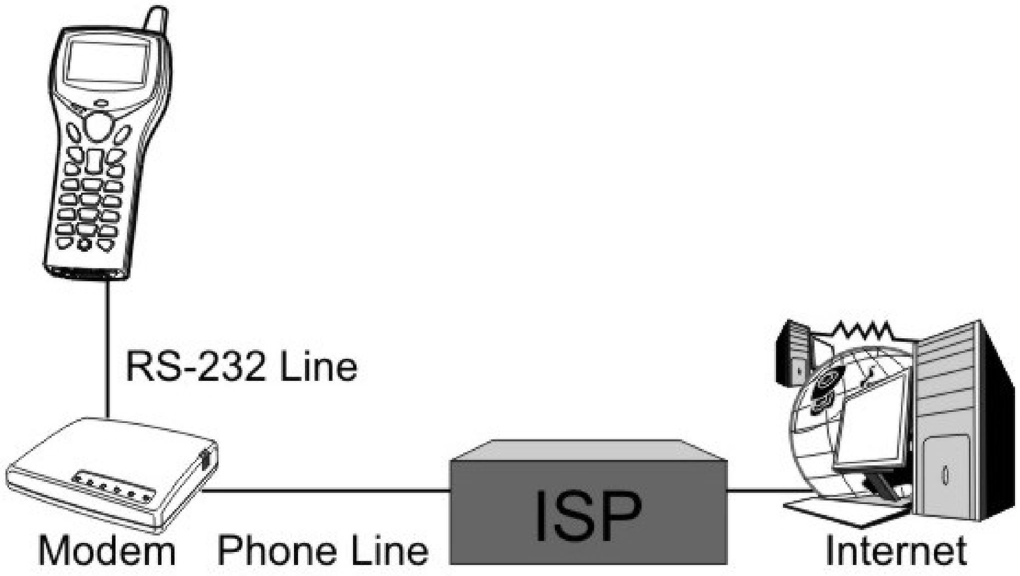
It is supported on the 8000/8300/8500 series when making use of the proprietary modem cradle. For baud rate setting, any value other than 57600 bps (default) must be configured through the DIP switch of the IR control board.



Note: For the 8000/8300 series, the version of IR control board on the modem cradle must be greater than SV3.01.

PPP Connection via RS-232

It is supported on the 8300 series only (direct RS-232).



Example of PPP Connection

Follow the same programming flow of WLAN (802.11b) Example.

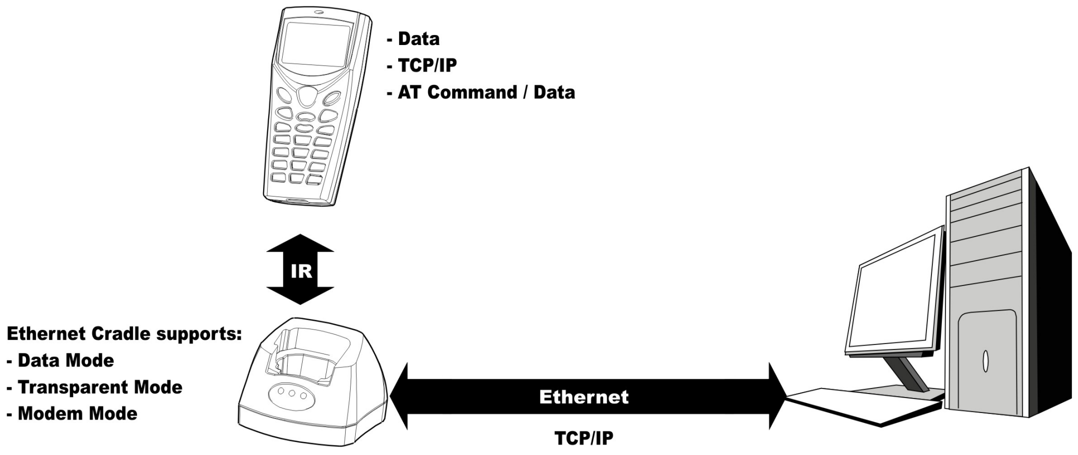
Before calling **START TCPIP(4)** or **START TCPIP(5)**, the following parameters of PPP must be specified.

Index		**Configuration Item**	**Remarks**
-70	70	PPP_DIALUPPHONE [20]	Phone number of ISP
-71	71	PPP_LOGINNAME [39]	Login user name of ISP
-72	72	PPP_LOGINPASSWORD [20]	Login password of ISP
-73	73	PPP_BAUDRATE (cf. SET_COM)	Baud rate matching modem cradle or modem

Note: For baud rate values of IR or RS-232, see the baud rate parameter in SET_COM.

5.19.2 Ethernet via IR

It is supported on the 8000/8300/8500 series when making use of the proprietary Ethernet cradle.



Example of Ethernet Connection

If you configure the Ethernet cradle to work in Transparent mode, follow the same programming flow of WLAN (802.11b) Example.

Refer to the Ethernet Cradle manual for more information on the working modes.

5.20 RF Communications

This section describes the BASIC functions and statements related to Radio Frequency communications. These commands are for the use of some specific models as shown below.

5.20.1 RF Models & Specifications

Below are the two types of RF communications and their specifications. A base refers to a base station, either for Narrow Band (433 MHz) or Spread Spectrum (2.4 GHz).

RF Product Family	**Narrow Band**		**Spread Spectrum**	
Terminal	8110	8310	8150	8350
Base Station	3510		3550	

Narrow Band (also referred to as 433 MHz RF)	
Frequency Range:	433.12 ~ 434.62 MHz
Data Rate:	9600 bps
Programmable Channels:	4
Coverage:	200 meters line-of-sight
Max. Output Power:	10 mW (10 dbm)
Spread Spectrum:	None
Modulation:	FSK (Frequency Shift Keying)

Spread Spectrum (also referred to as 2.4 GHz RF)	
Frequency Range:	2.4000 ~ 2.4835 GHz, unlicensed ISM Band
Data Rate:	19200 bps
Programmable Channels:	6
Coverage:	1000 meters line-of-sight
Max. Output Power:	100 mW
Spread Spectrum:	Frequency Hopping Spread Spectrum (FHSS)
Modulation:	GFSK
Frequency Control:	Direct FM

Note: All specifications are subject to change without prior notice.

5.20.2 RF System Requirements

Basics	
Base to Host:	RS-232 connection
Base Baud Rate:	Up to 115,200 bps
Base to Base:	RS-485 connection
Number of Bases per System:	Maximum 16
433 MHz RF System	
Number of Terminals per Base:	Maximum 15
Number of Terminals per System:	Maximum 45
2.4 GHz RF System	
Number of Terminals per Base:	Maximum 99
Number of Terminals per System:	Maximum 99

IDs and Groups

An ID to a terminal or a base is like a name to a person. Each terminal/base in the same RF system must have a unique ID so that the system will work properly.

For the 433 MHz RF system, up to 45 terminals and 16 bases can be supported by one system. The valid ID ranges from 1 to 45 for terminals, and 1 to 16 for bases. To support all 45 terminals, the 433 MHz RF bases need to be configured to 3 groups. Each group, as well as each base, can support up to 15 terminals.

- Base IDs (433 MHz): 01 ~ 16
- Terminal IDs (433 MHz): 01 ~ 45

  (3 groups: 01 ~ 15 supported by Group 1 bases
  16 ~ 30 supported by Group 2 bases
  31 ~ 45 supported by Group 3 bases)

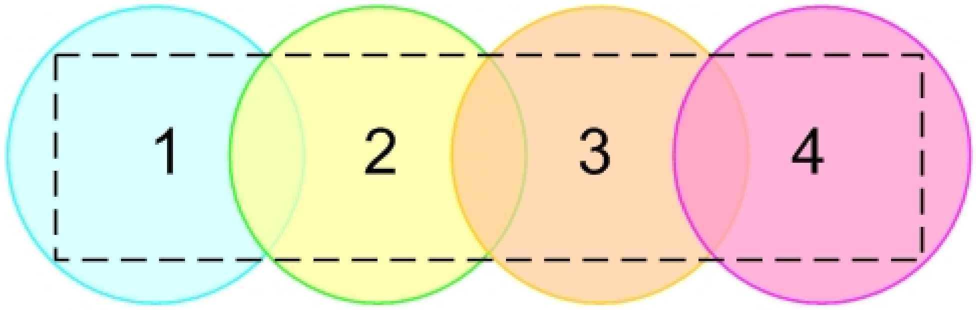
For the 2.4 GHz RF system, up to 99 terminals and 16 bases can be supported by one system, and they all belong to one group. The valid ID ranges from 1 to 99 for terminals, and 1 to 16 for bases.

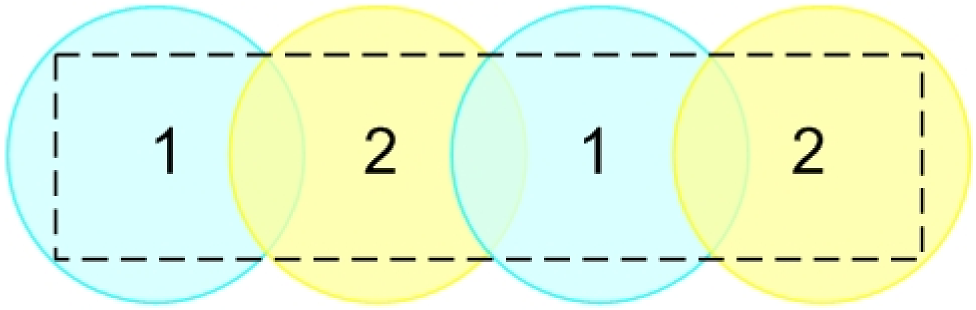
- Base IDs (2.4 GHz): 01 ~ 16
- Terminal IDs (2.4 GHz): 01 ~ 99

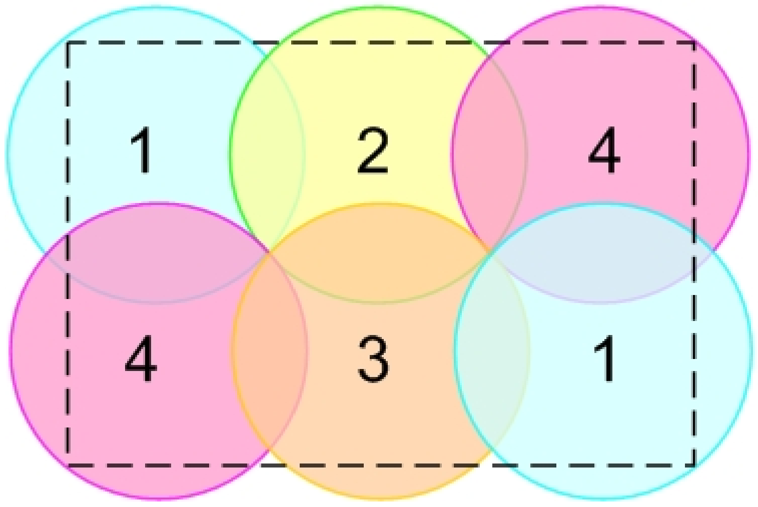
5.20.3 RF Topology & Roaming

You may need to install more than one base station to cover the most of your working floor so that you can move around and stay connected all the time. There is one simple rule: two adjacent bases must not use the same channel.

The following are several types of deployment for the 433 MHz RF system. Each circle represents the area covered by one base, and the number inside the circle refers to the channel of the base. The square in dashed line represents the working floor.







By default, a terminal can automatically switch to a different channel depending on its location. This is called "roaming". If the terminal is set to be able to auto search available channels nearby, whenever it cannot find the base that it is registered to, it will change its channel and try to connect to another base inside the system.

With this auto-switching capability, the virtual working area for one terminal is not restricted to the coverage one base, but to the overall coverage of the whole system.

5.20.4 RF System Deployment

Before deploying an RF system, these tasks need to be carried out: site survey and planning, installation, and testing.

Site Survey & Planning

Below are the guidelines for site surveying and planning:

- Test the base station's coverage

  The coverage may be affected by several environmental factors, such as:

  - Background noise from other equipment.

  - Interference from other RF systems nearby.

  - Shielding by metallic or concrete structures of the building.

  - Humidity and other wave absorption materials.

- Estimate the number of base stations as needed
- Estimate the number of terminals as needed
- Determine the base station's deployment topology

Installation

If possible, always install the RF base close to the center of the working floor to deliver better coverage. For the antenna to access as much free space as possible, install the base to a higher position.

Testing

Select the maximum output power (10 dbm) to test the transmission coverage and response time. Then try out each channel to get the best performance. If the coverage satisfies your needs, repeat the above procedure with lower output power. The benefits in using lower output power are:

- to conserve battery power
- to reduce the possibility of interference to other RF systems

The power consumption for sending and receiving is about 60 mA and 25 mA maximum, respectively. The five tunable output power settings are:

- 10 dbm (10.0 mW)
- 5 dbm (3.16 mW)
- 4 dbm (2.51 mW)
- 0 dbm (1.00 mW)
- -5 dbm (0.32 mW)

5.20.5 RF Terminal Properties

Below are the RF properties on terminal.

433 MHz Terminal Properties (8110, 8310)

Channel:	1 ~ 4
ID:	1 ~ 45
Timeout:	1 ~ 99 seconds (duration of retries for sending data)
Output Power:	1 ~ 5 levels (10, 5, 4, 0, -5 dbm)
Auto Search:	0 ~ 99 seconds (automatically search for available channel when the connection to the current channel is lost)

2.4 GHz Terminal Properties (8150, 8350)

Channel:	1 ~ 6
ID:	1 ~ 99
Timeout:	1 ~ 99 seconds (duration of retries for sending data)
Output Power:	1 level (64 mW)
Auto Search:	0 ~ 99 seconds (automatically search for available channel when the connection to the current channel is lost)

CHECK_RF_BASE — 8110, 8310, 8150, 8350

Purpose To check if the terminal is connected to a base.

Syntax ***A%*** = CHECK_RF_BASE

Remarks "***A%***" is an integer variable to be assigned to the result.

A%	Meaning
0	No base found.
1	Base is present.

Example

```
IF (CHECK_RF_BASE = 1) THEN
...
END IF
```

See Also SEARCH_RF_CHANNEL

CHECK_RF_SEND — 8110, 8310, 8150, 8350

Purpose To check if data has been sent successfully or not.

Syntax *A%* = CHECK_RF_SEND

Remarks "*A%*" is an integer variable to be assigned to the result.

A%	Meaning
0	Fail to send.
1	Sent successfully.

Example

```
RESEND:
WRIT_COM(2, A$)
IF (CHECK_RF_SEND = 0) THEN
   GOTO RESEND
END IF
```

See Also

GET_RF_CHANNEL 8110, 8310, 8150, 8350

Purpose To get the channel number assigned to the terminal.

Syntax *A%* = GET_RF_CHANNEL

Remarks "*A%*" is an integer variable to be assigned to the result.

Example channel% = GET_RF_CHANNEL

See Also SET_RF_CHANNEL

GET_RF_ID 8110, 8310, 8150, 8350

Purpose To get the terminal ID.

Syntax *A%* = GET_RF_ID

Remarks "*A%*" is an integer variable to be assigned to the result.

Example Id% = GET_RF_ID

See Also SET_RF_ID

GET_RF_POWER 8110, 8310, 8150, 8350

Purpose To get the level of the RF output power. (applicable to 433 MHz only)

Syntax *A%* = GET_RF_POWER

Remarks "*A%*" is an integer variable to be assigned to the result.

Example level% = GET_RF_POWER

See Also SET_RF_POWER

SEARCH_RF_CHANNEL 8110, 8310, 8150, 8350

Purpose To automatically search for available channels when not being connected to a base for a specific period of time

Syntax SEARCH_RF_CHANNEL(***N%***)

Remarks "***N%***" is an integer variable, indicating a specified period of time in units of 1 second.

Example SEARCH_RF_CHANNEL(10)

See Also CHECK_RF_BASE, SET_RF_CHANNEL, SET_RF_TIMEOUT

SET_RF_CHANNEL 8110, 8310, 8150, 8350

Purpose To set the channel of the terminal.

Syntax SET_RF_CHANNEL(***N%***)

Remarks "***N%***" is an integer variable, indicating the specified channel for the terminal.

N%	Meaning
1 ~ 4	Channels available for 433 MHz.
1 ~ 6	Channels available for 2.4 GHz.

Example SET_RF_CHANNEL(1)

See Also GET_RF_CHANNEL, SEARCH_RF_CHANNEL

SET_RF_ID 8110, 8310, 8150, 8350

Purpose To set the terminal ID.

Syntax SET_RF_ID(***N%***)

Remarks "***N%***" is an integer variable, indicating the ID of the terminal.

N%	Meaning
1 ~ 45	IDs available for 433 MHz.
1 ~ 99	IDs available for 2.4 GHz.

Example SET_RF_ID(1)

See Also GET_RF_ID

SET_RF_POWER 8110, 8310, 8150, 8350

Purpose To set the RF output power. (applicable to 433 MHz only)

Syntax SET_RF_POWER(***N%***)

Remarks "***N%***" is an integer variable, indicating the power level of the terminal.

N%	Meaning
1	10 dbm
2	5 dbm
3	4 dbm
4	0 dbm
5	-5 dbm

Example SET_RF_POWER(2)

See Also GET_RF_POWER

SET_RF_TIMEOUT 8110, 8310, 8150, 8350

Purpose To set a period of time for attempting to send data.

Syntax SET_RF_TIMEOUT(***N%***)

Remarks "***N%***" is an integer variable, indicating a specified period of time in units of 1 second.

If set to 0, it will be determined by the system.

Example SET_RF_TIMEOUT(5)

See Also SEARCH_RF_CHANNEL

5.20.6 RF Base Properties

The RF terminals must communicate with the RF base stations. Below are the RF properties on base stations.

433 MHz Base Properties (3510)	
Mode:	1 - standalone, 2 - slave, 3 - master
Channel:	1 ~ 4
ID:	01 ~ 16
Group:	1 ~ 3
Timeout:	1 ~ 99 seconds (duration of retries for sending data)
Output Power:	1 ~ 5 levels (10, 5, 4, 0, -5 dbm)
Baud Rate:	115200, 57600, 38400, 19200, 9600

2.4 GHz Base Properties (3550)	
Mode:	1 - standalone, 2 - slave, 3 - master
Channel:	1 ~ 6
ID:	01 ~ 16
Group:	1
Timeout:	1 ~ 99 seconds (duration of retries for sending data)
Output Power:	1 level (100 mW)
Baud Rate:	115200, 57600, 38400, 19200, 9600

Note: If more than two base stations are connected together, the one connected to the host computer needs to be set to master mode, while the rest to slave mode.

RS-232 Host Commands Set

Automatically Update Status: @AT **RF Base**

Purpose	To update information of bases and terminals automatically.
	Note that there will be no return of @BSbbgc if only one base exists.
Syntax	@AT\r
Return	@BSbbgc...\r (bbgc may repeat)
	bb: Base ID (01 ~ 16)
	g: Group number (1 ~ 3)

c: Channel number (1 ~ 4)

@TMbbtt…\r (tt may repeat)

bb: Base ID (01 ~ 16)

tt: Terminal ID (01 ~ 45)

Broadcast Data: @BC — RF Base

Purpose To broadcast data to all registered bases.

Note that all bases are connected via RS-485 as a daisy chain; therefore, data may not be sent to all registered bases if any of them fails.

Syntax @BC...ddd...\r

Return None

List Base Station: @BS — RF Base

Purpose To get information of bases, such as their groups and channels.

Syntax @BS\r

Return @BSbbgc...\r (bbgc may repeat)

bb: Base ID (01 ~ 16)

g: Group number (1 ~ 3)

c: Channel number (1 ~ 4)

Set / Get Channel: @CH — RF Base

Purpose To set or get the Base's channel.

Syntax @CHbbc\r

bb: Base ID (01 ~ 16)

c: New channel (1 ~ 4); set 0 to get the Base's channel.

Return @CHbbCoCn\r

bb: Base ID (01 ~ 16)

Co: Original channel (1 ~ 4)

Cn: New channel (1 ~ 4)

Send Data to Terminal: @DT — RF Base

Purpose To send data to the terminal.

Syntax @DTttdd...\r

tt: Terminal ID (01 ~ 45)

dd: Data string

Return @Oktt\r (succeed)

@NGtt\r (fail)

@WTtt\r (busy; data will be sent later)

Receive Data from Terminal: @DT — RF Base

Purpose To receive data from the terminal.

Syntax @DTbbttdd...\r

(Received) bb: Base ID (01 ~ 16)

tt: Terminal ID (01 ~ 45)

dd: Data string

Command / Format Error: @ER — RF Base

Purpose If the command or data being sent to the Base is incorrect, the Base returns @ER\r.

Set / Get Group: @GP — RF Base (433 MHz only)

Purpose To set or get the Base's group.

Syntax @GPbbg\r

bb: Base ID (01 ~ 16)

g: New group (1 ~ 3); set 0 to get the Base's group.

Return @GPbbGoGn\r

bb: Base ID (01 ~ 16)

Go: Original group (1 ~ 3)

Gn: New group (1 ~ 3)

Header of Data Packets: @HD — RF Base

Purpose To enable or disable the header of a data packet. By default, the data received will be prefixed with "@DTbbtt", where bb refers to Base ID and tt refers to Terminal ID. If the header is disabled, there will be no prefix at all.

Syntax @HDbbc\r

bb: Base ID (01 ~ 16)

c: set 0 to disable the header; set 1 to enable the header (default: enable)

Return @HDbbCoCn\r

bb: Base ID (01 ~ 16)

Co: Original setting (1~ 4)

Cn: New setting (1 ~ 4)

Change ID: @ID — RF Base

Purpose To change the Base ID.

Syntax @IDbbBB\r

bb: Original Base ID (01 ~ 16)

BB: New Base ID (01 ~ 16)

Return @IDbbBB\r

bb: Original Base ID (01 ~ 16)

BB: New Base ID (01 ~ 16)

Set / Get Mode: @ME — RF Base

Purpose To set or get the Base's mode.

Syntax @MEbbm\r

bb: Base ID (01 ~ 16)

m: Base mode (1 ~ 3); set 0 to get the Base's mode.

m	Meaning
0	Get info
1	Standalone
2	Slave
3	Master

Return @MEbbmomn\r

bb: Base ID (01 ~ 16)

mo: Original mode (1 ~ 3)

mn: New mode (1 ~ 3)

Change Output Power: @PW — RF Base (433 MHz only)

Purpose To change the Base's output power.

Syntax @PWbbp\r

bb: Base ID (01 ~ 16)

p: Power level (1 ~ 5); set 0 to get the Base's output power.

p	Meaning
0	Get info
1	10 dbm
2	5 dbm
3	4 dbm
4	0 dbm
5	-5 dbm

Return @PWbbPoPn\r

bb: Base ID (01 ~ 16)

Po: Original power level (1 ~ 5)

Pn: New power level (1 ~ 5)

Set Base Quiet: @QT — RF Base

Purpose To enable or disable the message (“@Oktt\r”, “@NGtt\r”, “@WTtt\r”) generation of the Base when sending data to the terminal.

Syntax @QTbbs\r

bb: Base ID (01 ~ 16)

s: set 0 for responsive; set 1 for quiet (i.e. no message)

Return @QTbbSoSn\r

bb: Base ID (01 ~ 16)

So: Original state

Sn: New state

RS-232 Baud Rate: @SP — RF Base

Purpose To change the RS-232 baud rate setting of the Base.

Note that the connection has to be restarted with new setting.

Syntax @SPbbs\r

bb: Base ID (01 ~ 16)

s: Baud rate setting

s	Meaning
115200	Baud rate in bps
57600	
38400	
19200	
9600	
4800	
2400	
1200	

Return None

List Terminal: @TM RF Base

Purpose To list terminals that are registered to the Base or bases.

Syntax @TMbb\r

bb: Base ID (01 ~ 16); set 00 for all bases.

Return @TMbbtt…\r (tt repeat)

bb: Base ID (01 ~ 16)

tt: Terminal ID (01 ~ 45)

Transmission Timeout: @TO RF Base

Purpose To set or get the timeout setting.

Syntax @TObbtt\r

bb: Base ID (01 ~ 16)

tt: Timeout setting (01 ~ 99 sec); set 00 to get the current timeout.

Return @TObbttTT\r

bb: Base ID (01 ~ 16)

tt: Original timeout (01 ~ 99 sec)

TT: New timeout (01 ~ 99 sec)

Update Program: @UP RF Base

Purpose	To enter the download mode for updating the Base program.
Syntax	@UPbb\r
	bb: Base ID (01 ~ 16)
Return	@UPbb\r
	bb: Base ID (01 ~ 16)
	The Base is ready for downloading new program after returning this message.

5.20.7 RF Example

- Set COM port (SET_COM_TYPE):

  Assign COM2 to RF communication, i.e. **SET_COM_TYPE (2, 5)**.

- Open COM port (OPEN_COM):

  To initialize the RF module and set up connection, call **OPEN_COM (2)**.

- Set COM delimiter:

  For example, use carriage return (0x0d) as the string delimiter by calling **COM_DELIMITER (2, 13)**.

- Data transmission:

  To transmit data, call **WRITE_COM (2, A$)**.

  To receive data, call **A$ = READ_COM$ (2)**.

- Close COM port (CLOSE_COM):

  To disable the RF module, call **CLOSE_COM (2)**.

5.21 Wireless Communications

This section describes the commands related to wireless network configuration.

▪ WLAN	stands for	IEEE 802.11b
▪ PAN	stands for	Personal Area Networking Profile of Bluetooth
▪ SPP	stands for	Serial Port Profile of Bluetooth
▪ DUN	stands for	Dial-Up Networking Profile of Bluetooth for connecting a Modem
▪ DUN-GPRS	stands for	Dial-Up Networking Profile of Bluetooth for activating a mobile's GPRS
▪ HID	stands for	Human Interface Device Profile of Bluetooth
▪ GSM	stands for	Global System for Mobile Communications
▪ GPRS	stands for	General Packet Radio Service

5.21.1 Wireless Models

These commands are for the use of the following models.

Wireless Product Family

	Bluetooth	**WLAN (802.11b)**	**Bluetooth + 802.11b**	**GSM/GPRS**
Terminal	8061 8360 8500	8071 8370	8330 8570	8590 (based on 8500 or 8570)
Access Point	3560	3570	N/A	N/A

Note: Refer to the previous section for port mapping of Bluetooth and GSM.

IEEE 802.11b

IEEE 802.11b is an industrial standard for Wireless Local Area Networking (WLAN), which enables wireless communications over a long distance.

The speed of the connection between wireless devices will vary with range and signal quality. To maintain a reliable connection, the 802.11b system automatically fallback from 11 Mbps to 5.5, 2 or 1 Mbps as range increases or signal quality decreases.

802.11b Specification	
Frequency Range:	2.4 ~ 2.5 GHz
Data Rate:	11, 5.5, 2, 1 Mbps auto-fallback
Connected Devices:	1 for ad-hoc mode (No AP)
	Multiple for infrastructure mode (AP required)
Protocol:	IP/TCP/UDP
Coverage:	250 meters line-of-sight
Max. Output Power:	100 mW
Spread Spectrum:	DSSS
Modulation:	DBPSK (1 Mbps), DQPSK (2 Mbps), CCK (11 Mbps)
Standard:	IEEE 802.11b, interoperable with Wi-Fi devices

Note: All specifications are subject to change without prior notice.

Bluetooth

- Serial Port Profile (SPP) is for ad-hoc networking, without going through any access point.
- Dial-Up Networking Profile (DUN) makes use of a Bluetooth modem or mobile phone as a wireless modem.

  Also, it can be used to activate the GPRS functionality on a mobile phone.
- Human Interface Device Profile (HID) allows a terminal to work as an input device, i.e. keyboard, for a host computer.
- Personal Area Networking Profile (PAN) makes use of Bluetooth Network Encapsulation Protocol (BNEP) for IP networking over Bluetooth.

  Access points (AP) are required. Use the same commands as for 802.11b - TCP/IP networking.

Bluetooth Specification	
Frequency Range:	2.4 ~ 2.5 GHz
Data Rate:	433 kbps
Connected Devices:	1 for DUN mode
	Up to 7 for SPP or PAN mode (AP required)
Profiles:	SPP, DUN, HID, PAN
Coverage:	Class 1: 250 meters line-of-sight (8061/8360)
	Class 2: 10 meters line-of-sight (8330/8500)
Max. Output Power:	100 mW (Class 1)
	10 mW (Class 2)
Spread Spectrum:	FHSS
Modulation:	GFSK
Standard:	Bluetooth version 1.1

Note: All specifications are subject to change without prior notice.

5.21.2 Network Configuration

Before bringing up (initializing) the network, some related parameters must be configured. These parameters are kept by the system during normal operations and power on/off cycles.

The parameters can be accessed through the System Menu or an application program (via **GET_NET_PARAMETER$**, **SET_NET_PARAMETER**).

Note: The parameters will be set back to the default values when updating kernel.

Index		Configuration Item	Default Setup String	WLAN	SPP	DUN	PAN
GET_NET_ PARAMETER	SET_NET_ PARAMETER						
0 ~ 3		REMOTE_IP (string)	Read only	✓			✓
-1	1	LOCAL_IP (string)	0.0.0.0	✓			✓
-2	2	SUBNET_MASK (string)	0.0.0.0	✓			✓
-3	3	DEFAULT_GATEWAY (string)	0.0.0.0	✓			✓
-4	4	DNS_SERVER (string)	0.0.0.0	✓			✓
-5	5	LOCAL_NAME [33]	S/N	✓	✓	✓	✓
-6	6	SS_ID [33]	---	✓			
-7 to -10	7 to 10	WEP_KEY_1~4 [14]	---	✓			
-11	11	DHCP_ENABLE	Enable	✓			✓
-12	12	AUTHEN_ENABLE	Open	✓			
-13	13	WEP_LEN	128 bits	✓			
-14	14	SYSTEM_SCALE	Medium	✓			
-15	15	DEFAULT_WEP_KEY	1	✓			
-16		DOMAIN_NAME [129]	Read only	✓			✓
-17	17	WEP_ENABLE	Disable	✓			
-18	18	EAP_ENABLE	Disable	✓			
-19	19	EAP_ID [33]	---	✓			
-20	20	EAP_PASSWORD [33]	---	✓			
-21	21	POWER_SAVE_ENABLE	Enable	✓			
-22	22	PREAMBLE	Long	✓			
-23		MAC_ID [6]	Read only	✓			
-24		BT_MACID [6]	Read only		✓	✓	✓

-25	25	BT_REMOTE_NAME [20]	---		✓	✓	✓
-26	26	BT_SECURITY	Disable		✓	✓	✓
-27	27	BT_PIN_CODE [16]	---		✓	✓	✓
-28	28	BT_BROADCAST_ON	Enable		✓	✓	✓
-29	29	BT_POWER_SAVE_ON	Enable		✓	✓	✓
-30	30	ADHOC	Disable	✓			
-31		FIRMWARE_VERSION [4]	Read only	✓			
-32	32	BT_GPRS_APNAME [20]	---			✓	
-33	33	WPA_ENABLE	Disable	✓			
-34	34	WPA_PASSPHRASE [64]	---	✓			
-40 to -47	40 to 47	BT_FREQUENT_DEVICE 1~8	---		✓	✓	✓

Index		**Configuration Item**	**Default Setup String**	**GSM**	**GPRS**
GET_NET_ PARAMETER	**SET_NET_ PARAMETER**				
-60		GSM_SERVICE_CENTER [21]	Read only	✓	
-61	61	GSM_PIN_CODE [9]	---	✓	✓
-62	62	GPRS_AP [21]	---		✓
-63		GSM_NET [21]	Read only	✓	
-64	64	GSM_MODEM_DIAL_NUM [21]	---	✓	

Index		**Configuration Item**	**Default Setup String**	**PPP**
GET_NET_ PARAMETER	**SET_NET_ PARAMETER**			
-70	70	PPP_DIALUPPHONE [20]	---	✓
-71	71	PPP_LOGINNAME [39]	---	✓
-72	72	PPP_LOGINPASSWORD [20]	---	✓
-73	73	PPP_BAUDRATE (cf. SET_COM)	1	✓

Note: The number in a pair of square brackets indicates the length of a string, e.g. GPRS_AP [21] means the maximum length of the string for remote IP address is 21 characters.

GET_NET_PARAMETER$ 8000, 8300, 8500

Purpose To get network settings.

Syntax ***A$*** = GET_NET_PARAMETER$(***index%***)

Remarks "***A$***" is a string variable to be assigned to the result.

"***index%***" is an integer variable, indicating a specific configuration item by index number.

Error Code	Meaning
0	Normal status: connection is open
3000	Invalid index number
3004	Connection is closed
3012	Never run START TCPIP

Example NetSetting$ = GET_NET_PARAMETER$(0)

See Also SET_NET_PARAMETER, SOCKET_IP, TCP_ERR_CODE

SET_NET_PARAMETER 8000, 8300, 8500

Purpose To configure network settings.

Syntax SET_NET_PARAMETER(***index%, A$***)

Remarks Note that it is not necessary to configure the setting every time.

"***index%***" is an integer variable, indicating a specific configuration item by index number.

"***A$***" is a string variable indicating the network setting to be configured.

A$	Setup string
(Boolean type)	"Enable" / "Disable"
Authentication	"Open" / "Share"
WEP Key Length	"64 bits" / "128 bits"
System Scale	"Low" / "Medium" / "High"
Preamble Type	"Short" / "Long" / "Both"
WPA Pass Phrase	8 ~ 63 characters

For indexes 5 ~ 10, 19, 20, 25, 27, 32, you may simply input an empty string to clear settings.

Example

```
SET_NET_PARAMETER (1, "192.168.1.241")  ' set local IP
SET_NET_PARAMETER (11, "Disable")       ' disable DHCP
SET_NET_PARAMETER (12, "Share")         ' set authentication "Share Key"
```

See Also GET_NET_PARAMETER$, IP_CFG, TCP_ERR_CODE

5.21.3 Initialization & Termination

After the networking parameters are properly configured, an application program can call **START TCPIP** to initialize any wireless module (802.11b, Bluetooth, or GSM/GPRS) and networking protocol stack. The wireless modules will not be powered until **START TCPIP** is called.

Model No.	START TCPIP (N%)	Remarks
All	START TCPIP (4)	Enables PPP connection via IR (Modem Cradle)
	START TCPIP (6)	Enables Ethernet connection via IR (Ethernet Cradle)
8061	START TCPIP	Enables Bluetooth (PAN)
	START TCPIP (3)	Enables mobile's GPRS functionality via Bluetooth (DUN)
8071	START TCPIP	Enables 802.11b (WLAN)
8330	START TCPIP START TCPIP (0)	Enables 802.11b (WLAN)
	START TCPIP (1)	Enables Bluetooth (PAN)
	START TCPIP (3)	Enables mobile's GPRS functionality via Bluetooth (DUN)
	START TCPIP (5)	Enables PPP connection via direct RS-232 (to a generic modem)
8360	START TCPIP	Enables Bluetooth (PAN)
	START TCPIP (3)	Enables mobile's GPRS functionality via Bluetooth (DUN)
	START TCPIP (5)	Enables PPP connection via direct RS-232 (to a generic modem)
8370	START TCPIP	Enables 802.11b (WLAN)
	START TCPIP (5)	Enables PPP connection via direct RS-232 (to a generic modem)
8500	START TCPIP START TCPIP (0)	Enables 802.11b (WLAN)
	START TCPIP (1)	Enables Bluetooth (PAN)
	START TCPIP (2)	Enables GPRS
	START TCPIP (3)	Enables mobile's GPRS functionality via Bluetooth (DUN)

When an application program needs to stop using the network, **STOP TCPIP** must be called to shut down the network as well as the modules (so that power can be saved). To enable the network again, **START TCPIP** must be called again.

Note: Any previous network connection and data will be lost after calling STOP TCPIP.

START TCPIP 8000, 8300, 8500

Purpose To enable TCP/IP communication.

Syntax START TCPIP

START TCPIP(***N%***)

Remarks This routine is used to perform general initialization. It must be the first network function call, and cannot be called again unless STOP TCPIP has been called.

"***N%***" is an integer variable, indicating which wireless module is to be used.

N%	Meaning
0	802.11b (default)
1	Bluetooth (PAN)
2	GPRS
3	Mobile's GPRS via Bluetooth (DUN)
4	PPP Connection via IR
5	PPP Connection via RS-232
6	Ethernet Connection via IR

Example
```
START TCPIP                              ' this is hardware-dependent
```

See Also OFF TCPIP, ON TCPIP GOSUB..., STOP TCPIP, TCP_ERR_CODE, TCP_OPEN

STOP TCPIP 8000, 8300, 8500

Purpose To disable TCP/IP communication.

Syntax STOP TCPIP

Remarks

Example STOP TCPIP

See Also START TCPIP, TCP_OPEN

5.21.4 Network Status

Once the network has been initialized, there is some status information can be retrieved from the system. It will be periodically updated by the system. User program must explicitly call **GET_NET_STATUS** to get the latest status.

Index	Configuration Item	Return Value		WLAN	SPP	DUN_ Modem	DUN- GPRS	PAN
GET_NET_ STATUS								
1	WLAN_State: connection state	0 1	Disabled Connected	✓				
2	WLAN_Quality: link quality	0 to 10 10 to 15 15 to 30 30 to 50 50 to 80	Very poor Poor Fair Good Very good	✓				
3	WLAN_Signal: signal strength level	0 to 30 30 to 60 60 to 120	Weak Moderate Strong	✓				
4	WLAN_Noise: noise Level	1 2 to 3 4 to 5	Weak Moderate Strong	✓				
5	WLAN_Channel: current channel no.	1 ~ 11		✓				
6	WLAN_TxRate: transmit rate	1 2 4 8 16 32 48 64 80 96 112 128	1 Mbps 2 Mbps 5.5 Mbps 11 Mbps 6 Mbps 9 Mbps 12 Mbps 18 Mbps 24 Mbps 36 Mbps 48 Mbps 54 Mbps	✓				

7	NET_IPReady: terminal IP status	-1 0 1	Error* Not ready Ready	✓			✓	✓
8	BT_State: connection state	0 1	Disabled Connected		✓	✓	✓	✓
9	BT_Signal: RSSI signal level	-10 to -6 -6 to 5 5 to 30	Weak Moderate Strong		✓	✓	✓	✓

Index	**Configuration Item**	**Return Value**		**GSM**	**GPRS**
GET_NET_STATUS					
10	GSM_state: connection state	0 1	Disabled Connected	✓	✓
11	GSM_RSSIQuality: RSSI signal level	0 1 2 (3 ~ 29) 30 31 99	-113 dbm or less -111 dbm -109 dbm ... (+2 dbm per increment) -53 dbm -51 dbm or greater Not known or not detectable	✓	
12	GSM_PINstate: PIN code status	0 1	Disabled PIN code required	✓	✓

Note: If GET_NET_STATUS(7) returns -1, it means an abnormal break occurs during PPP, DUN-GPRS, or GPRS connection. Such disconnection may be caused by the terminal being out of range, improperly turned off, etc.

GET_NET_STATUS — 8000, 8300, 8500

Purpose To get network status.

Syntax *A%* = GET_NET_STATUS(***index%***)

Remarks Note that it is necessary to define the DNS server IP before running this command.

"***A%***" is an integer variable to be assigned to the result.

"***index%***" is an integer variable indicating a specific configuration item by index number.

Example

```
nQuality = GET_NET_STATUS(2)          ' check communication quality
```

See Also GET_WLAN_STATUS, TCP_ERR_CODE

GET_WLAN_STATUS 8000, 8300, 8500

Purpose To get network status.

Syntax ***A%*** = GET_WLAN_STATUS(***index%***)

Remarks **This command is to be replaced by GET_NET_STATUS.**

Example nQuality = GET_WLAN_STATUS (2) ' check communication quality

See Also GET_NET_STATUS, TCP_ERR_CODE

5.21.5 WLAN (802.11b)

Here are the BASIC functions and statements related to TCP/IP networking.

Commands for triggering the TCPIP event: **OFF TCPIP**, **ON TCPIP GOSUB...**

DNS_RESOLVER — 8000, 8300, 8500

Purpose To get the remote IP address by remote name.

Syntax ***IP$*** = DNS_RESOLVER(***A$***)

Remarks Note that it is necessary to define the DNS server IP before running this command.

"***IP$***" is a string variable to be assigned to the result.

"***A$***" is a string variable, indicating a specific remote name.

Example GetIP$ = DNS_RESOLVER ("www.cipherlab.com")

See Also TCP_ERR_CODE

GET_TCPIP_MESSAGE — 8000, 8300, 8500

Purpose To get the message of TCPIP event trigger.

Syntax ***A%*** = GET_TCPIP_MESSAGE

Remarks This command can also be called in normal program to detect the TCP/IP status by polling method. Once it is fetched, the message will be cleared by the system.

When entering TCPIP event trigger, the first thing is to call this routine so that the trigger message will be cleared out.

"***A%***" is an integer variable to be assigned to the result.

A%	Meaning
4000	Connection #0 overflow
4001	Connection #1 overflow
4002	Connection #2 overflow
4003	Connection #3 overflow
4013	Abnormal break during connection
4014	Networking initialization error
4015	Port initialization error
4020	Connection #0: connected
4021	Connection #1: connected
4022	Connection #2: connected

4023	Connection #3: connected
4040	Connection #0: disconnected
4041	Connection #1: disconnected
4042	Connection #2: disconnected
4043	Connection #3: disconnected
4060	Connection #0: data is coming
4061	Connection #1: data is coming
4062	Connection #2: data is coming
4063	Connection #3: data is coming
4080	IP is ready

Example
```
ON TCPIP GOSUB TCPIP_Trigger
...
TCPIP_Trigger:
MSG% = GET_TCPIP_MESSAGE
...
```

See Also OFF TCPIP, ON TCPIP GOSUB..., TCP_OPEN

IP_CFG or IP_CONFIGURE — 8000, 8300, 8500

Purpose To configure the TCP/IP setting.

Syntax IP_CFG(***index%, IP$***) or IP_CONFIGURE(***index%, IP$***)

Remarks **This command is to be replaced by SET_NET_PARAMETER.**

Note that it is not necessary to configure the setting every time.

"***index%***" is an integer variable, indicating a specific configuration item.

"***IP$***" is a string variable indicating the IP address that is to be configured.

Example
```
IP_CFG (1, "192.168.1.241")        ' set local IP
IP_CFG (2, "255.255.255.0")        ' set IP of subnet mask
IP_CFG (3, "192.168.1.250")        ' set IP of default gateway
IP_CFG (4, "168.95.1.1")           ' set IP of DNS server
```

See Also SET_NET_PARAMETER, TCP_ERR_CODE

NCLOSE — 8000, 8300, 8500

Purpose To close a TCP/IP connection.

Syntax NCLOSE(***N%***)

Remarks "***N%***" is an integer variable in the range of 0 to 3, indicating the connection number.

Example NCLOSE (0)

See Also NREAD$, NWRITE, TCP_ERR_CODE, TCP_OPEN

NREAD$ 8000, 8300, 8500

Purpose To read data from a TCP/IP connection.

Syntax ***A$*** = NREAD$(***N%***)

Remarks "***A$***" is a string variable to be assigned to the result.

"***N%***" is an integer variable in the range of 0 to 3, indicating the connection number.

Example A$ = NREAD$ (0)

See Also NCLOSE, NWRITE, OFF TCPIP, ON TCPIP GOSUB..., SOCKET_HAS_DATA, TCP_ERR_CODE, TCP_OPEN

NWRITE 8000, 8300, 8500

Purpose To write data to a TCP/IP connection.

Syntax NWRITE (***N%, A$***)

Remarks "***N%***" is an integer variable in the range of 0 to 3, indicating the connection number.

"***A$***" is a string variable, representing the string to be sent to the connection.

Example NWRITE (0, "Hello")

See Also NCLOSE, NREAD$, SOCKET_CAN_SEND, TCP_ERR_CODE, TCP_OPEN

SOCKET_CAN_SEND 8000, 8300, 8500

Purpose To check if data can be sent.

Syntax ***A%*** = SOCKET_CAN_SEND(***N%, L%***)

Remarks "***A%***" is an integer variable to be assigned to the result.

A%	Meaning
0	Normal - data can be sent
3000	Invalid connection number
3004	Connection is closed
3007	Cannot send data
3012	Never run START TCPIP

"***N%***" is an integer variable in the range of 0 to 3, indicating the connection number.

"***L%***" is an integer variable, indicating the length of data.

Example A% = SOCKET_CAN_SEND (0, 10)

See Also NCLOSE, NWRITE, TCP_ERR_CODE, TCP_OPEN

SOCKET_HAS_DATA 8000, 8300, 8500

Purpose To check if data is available.

Syntax ***A%*** = SOCKET_HAS_DATA(***N%***)

Remarks "***A%***" is an integer variable to be assigned to the result.

A%	Meaning
0	Normal - data in buffer.
3000	Invalid connection number
3004	Connection is closed
3005	No data
3012	Never run START TCPIP

"***N%***" is an integer variable in the range of 0 to 3, indicating the connection number.

Example A% = SOCKET_HAS_DATA(0)

See Also NCLOSE, NREAD$, OFF TCPIP, ON TCPIP GOSUB..., TCP_ERR_CODE, TCP_OPEN

SOCKET_IP 8000, 8300, 8500

Purpose To get network settings.

Syntax ***A$*** = SOCKET_IP(***port%***)

Remarks **This command is to be replaced by GET_NET_PARAMETER$.**

Example NetSetting$ = SOCKET_IP(0)

See Also GET_NET_PARAMETER$, TCP_ERR_CODE

SOCKET_OPEN 8000, 8300, 8500

Purpose To check if the remote end of connection is open.

Syntax ***A%*** = SOCKET_OPEN(***N%***)

Remarks "***A%***" is an integer variable to be assigned to the result.

A%	Meaning
0	Normal - connection is open
3000	Invalid connection number
3004	Connection is closed

3012	Never run START TCPIP

"***N%***" is an integer variable in the range of 0 to 3, indicating the connection number.

Example ConnectState% = SOCKET_OPEN(0)

See Also TCP_ERR_CODE, TCP_OPEN

TCP_ERR_CODE 8000, 8300, 8500

Purpose To check the result after running any command related to TCP/IP (except STOP TCPIP).

Syntax ***A%*** = TCP_ERR_CODE

Remarks "***A%***" is an integer variable to be assigned to the result, indicating an error description.

If a routine is working normally, the return value will be 0 in general. However, it will return "N%"(the connection number) for TCP_OPEN and "1 ~ 255"(the length of data being read) for NREAD$.

A%	Meaning
0	Normal
3000	Invalid connection number
3001	Connection is already opened.
3002	Undefined local port in server mode
3003	Undefined remote port in client mode
3004	Connection is closed.
3005	No data received in buffer
3006	Data is too long.
3007	Networking is busy or data is too long.
3008	Data transmission error
3009	Hardware initialization failure
3010	START TCPIP has already been running. Need to run STOP TCPIP.
3011	All connections are unavailable.
3012	Never run START TCPIP
-10	Parameter error
-11	Host is not reachable.
-12	Time out
-13	Hardware failure
-14	Protocol error
-15	No buffer space
-16	Invalid connection block

-17	Invalid pointer argument
-18	Operation would block.
-19	Message is too long.
-20	Protocol unavailable
-30	Unknown remote name
-31	DNS protocol error (package class)
-32	DNS protocol error (package type)
-33	Remote name too long (more than 38 characters)

Example ERR% = TCP_ERR_CODE

See Also DNS_RESOLVER, GET_NET_PARAMETER$, GET_NET_STATUS, GET_WLAN_STATUS, IP_CFG, NCLOSE, NREAD$, NWRITE, OFF TCPIP, ON TCPIP GOSUB... SOCKET_CAN_SEND, SOCKET_HAS_DATA, SOCKET_IP, SOCKET_OPEN, START TCPIP, TCP_OPEN, SET_NET_PARAMETER

TCP_OPEN 8000, 8300, 8500

Purpose To open a TCP/IP connection.

Syntax TCP_OPEN(***N%, IP$, RP%, LP%,*** {***Protocol%***}, {***Delimiter%***})

Remarks Note that the function must be called before using any socket read/write commands.

"***N%***" is an integer variable in the range of 0 to 3, indicating the connection number.

"***IP$***" is a string variable, indicating the IP address of the remote port. If it is set to "0.0.0.0", the connection will become server mode and the LP% must be defined.

"***RP%***" is an integer variable, indicating the port number of the remote port, which is to be connected. If it is 0 (=none), any remote port is available. However, it has to be set to 0 when in server mode.

"***LP%***" is an integer variable, indicating the port number of the local port. If it is 0 (=none), the port number will be defined by the system. However, it has to be set to 0 when in client mode.

	Server mode	**Client mode**
N%	0 ~ 3	0 ~ 3
IP$	"0,0,0,0"	Required
RP%	0	Required
LP%	Required	0

"***Protocol%***" is an integer variable, indicating the networking protocol in use. This parameter is optional and it is set to 0 by default (using TCP/IP protocol). If it is set to 1, the system will use UDP/IP protocol.

"***Delimiter%***" is an integer variable, indicating whether to transmit the delimiter or not. This parameter is optional and it is set to 0x0d (Carriage Return) by default.

The valid values range from 0 to 255. If it is set to -1, the system will not transmit any delimiter.

Example

```
TCP_OPEN (0, "0.0.0.0", 0, 23)
TCP_OPEN (1, "0.0.0.0", 0, 24)
TCP_OPEN (2, "0.0.0.0", 0, 25, 1)
TCP_OPEN (3, "0.0.0.0", 0, 26, 0, 59)
```

See Also GET_TCPIP_MESSAGE, NCLOSE, NREAD$, NWRITE, OFF TCPIP, ON TCPIP GOSUB..., SOCKET_CAN_SEND, SOCKET_HAS_DATA, SOCKET_OPEN, START TCPIP, STOP TCPIP, TCP_ERR_CODE

WLAN Example

- Network Configuration:

  Generally, network configuration has to be done in advance by calling **GET_NET_PARAMETER$** and **SET_NET_PARAMETER**.

- Initialization of Networking Protocol Stack & Wireless Module:

  The wireless module, such as of 802.11b, Bluetooth or GSM/GPRS, will not be powered until **START TCPIP** is called.

Model#	WLAN	PAN	GPRS	DUN-GPRS
8061	---	START TCPIP	---	START TCPIP(3)
8360	---	START TCPIP	---	START TCPIP(3)
8071	START TCPIP	---	---	---
8370	START TCPIP	---	---	---
8330	START TCPIP START TCPIP(0)	START TCPIP(1)	---	START TCPIP(3)
8500	START TCPIP START TCPIP(0)	START TCPIP(1)	START TCPIP(2)	START TCPIP(3)

Note: For IR/RS-232 networking, use **START TCPIP(4)** for PPP via IR, **START TCPIP(5)** for PPP via RS-232, and **START TCPIP(6)** for Ethernet via IR.

- Network Status:

GET_TCPIP_MESSAGE

The **START TCPIP** routine does the first stage of the initialization process, and it will generate a system task to finish the rest of the process. When **START TCPIP** returns, the initialization process might not have been done yet. Therefore, it is necessary for the application program to check whether the status is "IP is ready" by calling **GET_TCPIP_MESSAGE** or **GET_NET_STATUS** before it proceeds to perform any networking operations.

GET_NET_STATUS

When initialization error occurs for PPP, DUN-GPRS, or GPRS connection, GET_NET_STATUS(7) will return -1.

Once the initialization process is done, the network status can be retrieved from the system. It will be periodically updated by the system. The application program must explicitly call **GET_NET_STATUS** to get the latest status.

- Open a Connection:

TCP_OPEN

Before reading and writing to the remote host, a connection must be established (opened). Call **TCP_OPEN** to open a connection. The application program needs to define a connection number (0~3), so that it can identify a particular connection in subsequent calls to other TCP/IP stack routines.

GET_TCPIP_MESSAGE

It is necessary for the application to check whether the status of the particular connection is "connected" by calling **GET_TCPIP_MESSAGE** before it proceeds to perform any read/write operations. Once the value of 4013 is returned (i.e. connection is dropped abnormally, say, the terminal is shut down accidentally or by the AUTO_OFF timer), user program has to specify its own handling method. For example, if you wish to reconnect, simply call **START TCPIP** again.

- Data Transmission

SOCKET_CAN_SEND

Before sending data to the network, call **SOCKET_CAN_SEND** to check if there is enough buffer size to write out the data immediately. It also can be used to check if the data being sent is more than 4 packets when there is no response from the remote host. Then, call **NWRITE** to send data on the network.

SOCKET_HAS_DATA

Before receiving data from the network, call **SOCKET_HAS_DATA** to check if there is data in the buffer. Then, call **NREAD$** to receive data on the network.

Note: In case of an abnormal break during PPP, DUN-GPRS, or GPRS connection, GET_TCPIP_MESSAGE will return 4013 while GET_NET_STATUS(7) will return -1.

- Useful Functions:

There are other routines for obtaining additional information or setting control for a connection.

SOCKET_OPEN, SOCKET_HAS_DATA, etc.

To check the connection status by polling method.

GET_NET_PARAMETER$

To get the networking configuration and the remote site IP address.

TCP_ERR_CODE

To get the operation result after calling any TCPIP routines.

TCPIP Event Trigger

ON TCPIP GOSUB... and OFF TCPIP are used to get higher working performance. Once the TCPIP event occurs, it is necessary for the application program to check the trigger type by getting the value of the **GET_TCPIP_MESSAGE** routine.

- Close a Connection:

  Call **NCLOSE** to terminate a particular connection when the application program does not use it any more.

- Termination of Networking Protocol Stack & Wireless Module:

  When the application program wishes to stop using the network, call **STOP TCPIP** to terminate networking and shut down the power to the module so that it can save power. To enable the network again, it is necessary to call **START TCPIP** again.

Note: After calling STOP TCPIP, any previous network connection and data will be lost.

5.21.6 Bluetooth

For the 8x60 series, it makes use of the pairing procedure to keep record of the latest connected device(s) for different modes, regardless of authentication enabled or not. This is so-called "Frequent Device List".

Coverage of Frequent Device List	
PAN mode	Up to eight access points are listed for roaming purpose
SPP mode	Only one device is listed for quick connection
DUN mode	Only one device is listed for quick connection
HID mode	Only one device is listed for quick connection

Once the pairing procedure is completed and the list is generated successfully, next time the terminal will automatically connect to the listed device(s) without going through the pairing procedure.

To complete the pairing procedure, it consists of two steps: (1) to discover the Bluetooth devices in range, and (2) to page one of them that provides a particular service. These are handled by BT_INQUIRY$ and BT_PAIRING respectively.

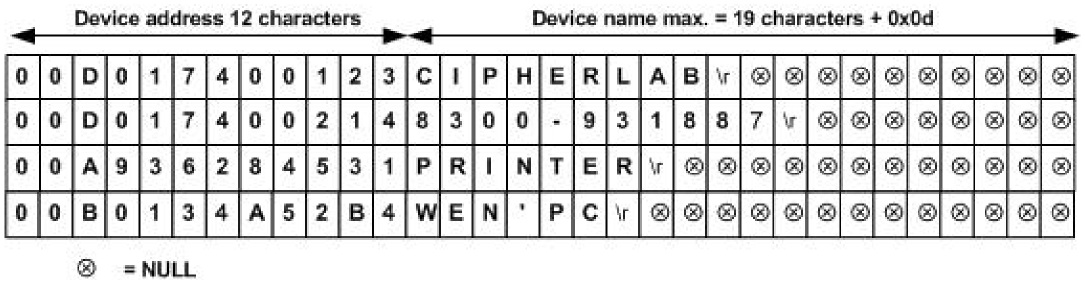
BT_INQUIRY$ — 8061, 8360, 8500

Purpose To discover any available Bluetooth devices in range.

Syntax *A$* = BT_INQUIRY$

Remarks It takes about 20 seconds to get the Bluetooth device information of whomever in range. The string contains address (12 bytes) and name (20 bytes) of the devices. Note that there might be many devices concatenated together, each occupying 32 bytes.

Information regarding the Bluetooth devices in range will be put in the format of MENU() string as shown below:



Device address 12 characters — Device name max. = 19 characters + 0x0d

0	0	D	0	1	7	4	0	0	1	2	3	C	I	P	H	E	R	L	A	B	\r	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗
0	0	D	0	1	7	4	0	0	2	1	4	8	3	0	0	-	9	3	1	8	8	7	\r	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗
0	0	A	9	3	6	2	8	4	5	3	1	P	R	I	N	T	E	R	\r	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗
0	0	B	0	1	3	4	A	5	2	B	4	W	E	N	'	P	C	\r	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗

⊗ = NULL

Example ...

```
MENU_STR$ = BT_INQUIRY$
I% = MENU(MENU_STR$)
...
```

See Also BT_PAIRING

BT_PAIRING 8061, 8360, 8500

Purpose To check if the discovered device can provide a specific type of service, and (if required), the PIN code for authentication is matching.

Syntax ***A%*** = BT_PAIRING(***addr$, type%***)

Remarks "***A%***" is an integer variable to be assigned to the result.

A%	Meaning
1	Pairing successfully
0	Service unavailable or wrong PIN code

"***addr$***" is a string variable, indicating the address of the Bluetooth device.

"***type%***" is an integer variable, indicating a specific type of service.

type%	Meaning
1	PAN (AP required)
3	SPP
4	DUN

It will try to pair with any Bluetooth device that has the specific type of service. If authentication is enabled, then correct PIN code will be required for setting up the Link Key. Once the pairing procedure is completed, the MAC ID of the remote device will be recorded in the "Frequent Device List" for quick connection in the future.

Example ...

```
MENU_STR$ = BT_INQUIRY$
I% = MENU(MENU_STR$)
DEVICE$ = MID$(MENU_STR$, 1+32*(I%-1), 32)
R% = BT_PAIRING(DEVICE$,3)
...
```

See Also BT_INQUIRY$

Frequent Device List

Get Frequent Device List

The length of Frequent Device List by calling **GET_NET_PARAMETE$** is 83 characters:

```
LIST$ = GET_NET_PARAMETER$(-40)
```

- The first character of Frequent Device List is the service type that the device is engaged. Currently, there are four types that have been defined:

Service Type		In Frequent Device List
1	PAN	Max. 8 devices are recorded
…	(= AP mode, access points are required.)	
3	SPP	Only 1 device is recorded
4	DUN	Only 1 device is recorded
5	HID	Only 1 device is recorded

(to be continued…)

Note: If bit 7 = 1, it means that this device is currently connected.

- After the service type, from the second to the 13th character stands for the string of MAC ID.
- The next property after MAC ID is Device Name, which consists of up to 20 characters and ends with a delimiter code "\r".
- The next property after Device Name is PIN code, which consists of up to 17 characters and ends with a delimiter code "\r".
- The last property of Frequent Device List is Link Key, which is normally generated when the pairing procedure is completed. This unique Link Key is applied to the specific device connection only. Once the connection is renewed with a different device, a new Link Key will be generated

Length	Property	Char												
1	**Service Type**	1	132											
2 ~ 13	**MAC ID**	12	"0"	"0"	"D"	"0"	"1"	"7"	"3"	"0"	"1"	"2"	"3"	"4"
14 ~ 33	**Device Name**	20	"M"	"Y"	" "	"N"	"A"	"M"	"E"	\r	0	....		0
34 ~ 50	**PIN Code**	17	"1"	"2"	"3"	"4"	\r	0	....					0
51 ~ 83	**Link Key**	33	"1"	"2"	"4"	"F"	"5"	"3"	....					\r

Note: Make sure to put “\r” as a delimiter for Device Name, PIN Code, and Link Key.

Sample code:

```
FREQ_DEV$ = ""
CLS
FOR K% = 1 TO 8
    FDL$ = ""
    FDL$ = GET_NET_PARAMETER$(-39-K%)
        IF MID$(FDL$,1,1)<>CHR$(0) THEN
            DEV$ = MID$(FDL$,14,20)
            MAC_ID$ = MID$(FDL$,2,12)
            MACHINE$ = MID$(FDL$,1,1)
            FREQ_DEV$ = FREQ_DEV$+DEV$
            FREQ_MAC$ = FREQ_MAC$+MAC_ID$
            FREQ_MC$ = FREQ_MC$+MACHINE$
        END IF
NEXT K%
I% = MENU(FREQ_DEV$)
```

Set Frequent Device List

To enable quick connection to a specific device without going through the inquiry and pairing procedure, a user-definable Frequent Device List can be set up by calling **SET_NET_PARAMETER**. If there is an existing Frequent Device List generated from the inquiry and pairing procedure, it then may be partially or overall updated by this, and vice versa.

- There are five fields: Service Type, MAC ID, Device Name, PIN Code, and Link Key.
- If authentication is disabled, you only need to specify the first three fields. Otherwise, the PIN code field needs to be specified for generating Link Key.

Sample code (1):

```
' setting up a DUN Frequent Device List without authentication
' by calling SET_NET_PARAMETER:
...
FDL$ = CHR$(4+128)+"00d017401234"+"TestDev."+CHR$(13)
SET_NET_PARAMETER(40,FDL$)
...
```

Sample code (2):

```
' setting up a SPP Frequent Device List with authentication
' (needs PIN code) by calling SET_NET_PARAMETER:
...
FDL$                                                        =
CHR$(3+128)+"00d017401234"+"TestDev."+CHR$(13)+"1234"+CHR$(1
3)
SET_NET_PARAMETER(40,FDL$)
...
```

Bluetooth Examples

To determine which application to initialize, use the second parameter of **SET_COM (N%, Baudrate%, Parity%, Data%, Handshake%)**.

- To initialize Bluetooth SPP Master, call **SET_COM (2,4,1,1,1)**.
- To initialize Bluetooth SPP Slave, call **SET_COM (2,1,1,1,1)**.
- To initialize Bluetooth DUN, call **SET_COM (2,5,1,1,1)**.
- To initialize Bluetooth HID, call **SET_COM (2,6,1,1,1)**.

Parameters	Values	Remarks
#1 (N%)	2	Indicates Bluetooth COM port is to be set.

#2 *(Baudrate%)*	1: 115200 bps
	2: 76800 bps
	3: 57600 bps
	4: 38400 bps
	5: 19200 bps
	6: 9600 bps
	7: 4800 bps
	8: 2400 bps
		The baud rate setting is NOT applicable to Bluetooth.
		Simply assign 1 for SPP Slave;
		4 for SPP Master;
		5 for DUN;
		6 for HID.

#3 *(Parity%)*	1: None 2: Odd 3: Even 4: Cradle commands	The parity setting is NOT applicable to Bluetooth. Simply assign 1 for Bluetooth.
#4 *(Data%)*	1: 7 data bits 2: 8 data bits	The data bits setting is NOT applicable to Bluetooth. Simply assign 1 for Bluetooth.
#5 *(Handshake%)*	1: None 2: CTS/RTS 3: XON/XOFF 4: Wedge Emulator	The handshake setting is NOT applicable to Bluetooth. Simply assign 1 for Bluetooth SPP/DUN/HID, or assign 4 for Bluetooth Wedge Emulator.

➢ **SPP**

- Call **SET_COM_TYPE (2, 5)** to set COM2 to Bluetooth communication.
- To initialize Bluetooth SPP Master, call **SET_COM (2,4,1,1,1)**.

  To initialize Bluetooth SPP Slave, call **SET_COM (2,1,1,1,1)**.
- Call **OPEN_COM (2)** to initialize the Bluetooth module and set up connection.
- Call **GET_NET_STATUS (8)** to detect if connection is completed. For example,

```
LOOP003:
IF GET_NET_STATUS(8) = 0 THEN GOTO LOOP003
BEEP(4400,4)
CLS
PRINT "Connect OK"
```

- Call **WRITE_COM (2)** and **READ_COM$ (2)** to transmit and receive data respectively.
- Call **GET_NET_STATUS (8)** to detect if connection is maintained. For example,

```
IF GET_NET_STATUS(8) = 0 THEN
BEEP(3300,4)
CLOSE_COM(2)
END IF
```

- Call **CLOSE_COM (2)** to terminate communication and shut down the Bluetooth module.

➢ **Wedge Emulator via SPP**

Instead of making use of the keyboard wedge interface, the “Serial to Keyboard Converter” program lets users convert data to keyboard input via Bluetooth SPP in general wedge functions, such as **SEND_WEDGE**, **SET_WEDGE**, and **WEDGE_READY**. That is, users can upgrade a normal wedge application to a “wireless” wedge application.

Refer to section 5.9.3 Wedge Emulator.

The “Serial to Keyboard Converter” program helps develop a keyboard key in application without any serial port input function. It supports multiple regions, i.e., an application can make use of this tool for varying keyboard layout.

All you need to do is to modify a few codes as shown below.

Note: Alternatively, you may apply Bluetooth HID for wedge application on the Bluetooth-enabled terminals.

SET_COM(N%, Baudrate%, Parity%, Data%, Handshake%) - To set the wedge emulation flag, use the last parameter regarding hardware handshake setting.

```
SET_COM_TYPE(2,5)
SET_COM(2,1,1,1,4)
OPEN_COM(2)
```

And then, use the normal wedge functions to send data.

```
SET_COM_TYPE(2,5)
SET_COM(2,1,1,1,4)
OPEN_COM(2)
CLS
PRINT "Wait to Connect"
LOOP000:
IF WEDGE_READY = 0 THEN GOTO LOOP000
BEEP(4400,4)
CLS PRINT "OK! Try to Send"

LOOP:
KeyData$ = INKEY$
IF KeyData$ = "" THEN GOTO LOOP

IF KeyData$ = "0" THEN
    IF WEDGE_READY = 1 THEN
        PRINT "READY"
    ELSE
        PRINT "NOT READY"
    END IF
ELSE IF KeyData$ = "1" THEN
    SEND_WEDGE("Hello")
ELSE IF KeyData$ = "2" THEN
    PRINT "Hello"
END IF
GOTO LOOP
```

➢ HID

Bluetooth HID makes use of the **WedgeSetting$** array to govern the HID operations. All definitions of **WedgeSetting$** remain the same, except that HID supports only 11 keyboard types, which is provided by Wedge_1$.

Setting Value	Terminal Type
0	Null (Data Not Transmitted)
1	PCAT (US)
2	PCAT (FR)
3	PCAT (GR)
4	PCAT (IT)
5	PCAT (SV)
6	PCAT (NO)
7	PCAT (UK)
8	PCAT (BE)
9	PCAT (SP)
10	PCAT (PO)
11	IBM A01-02 (Japanese OADG109)

Note: Wedge_3$ can be ignored for an inter-character delay is not applicable to Bluetooth HID.

- Set **WedgeSetting$**.
- Call **SET_COM_TYPE (2, 5)** to set COM2 to Bluetooth communication.
- Call **SET_COM (2,6,1,1,1)** to initialize Bluetooth HID.
- Call **OPEN_COM (2)** to initialize the Bluetooth module and set up connection.
- Call **GET_NET_STATUS (8)** to detect if connection is completed. For example,

```
LOOP003:
IF GET_NET_STATUS(8) = 0 THEN GOTO LOOP003
BEEP(4400,4)
CLS
PRINT "Connect OK"
```

- When there is a host device recorded in the Frequent Device List, the terminal will automatically connect to it. If the connection fails, the terminal will try again. If it fails for the second time, the terminal will wait 7 seconds for another host to initiate a connection. If still no connection is established, the terminal will repeat the above operation.

When there is no device recorded in the Frequent Device List, the terminal simply must wait for a host device to initiate a connection.

Note: As an HID input device (keyboard), the terminal must wait for a host to initiate a connection. Once the HID connection is established, the host device will be recorded in the Frequent Device List identified as HID Connection.

- Call **WRITE_COM (2, *data)** to transmit data.
- Call **GET_NET_STATUS (8)** to detect if connection is maintained. For example,

```
IF GET_NET_STATUS(8) = 0 THEN
BEEP(3300,4)
CLOSE_COM(2)
END IF
```

- Call **CLOSE_COM (2)** to terminate communication and shut down the Bluetooth module.

➢ **DUN**

- Call **SET_COM_TYPE (2, 5)** to set COM2 to Bluetooth communication.
- Call **SET_COM (2,5,1,1,1)** to initialize Bluetooth DUN.
- Call **OPEN_COM (2)** to initialize the Bluetooth module and set up connection.
- Call **GET_NET_STATUS (8)** to detect if connection is completed. For example,

```
LOOP003:
IF GET_NET_STATUS(8) = 0 THEN GOTO LOOP003
BEEP(4400,4)
CLS
PRINT "Connect OK"
```

- Call **WRITE_COM (2)** and **READ_COM$ (2)** to transmit and receive data respectively.
- Call **GET_NET_STATUS (8)** to detect if connection is maintained. For example,

```
IF GET_NET_STATUS(8) = 0 THEN
BEEP(3300,4)
CLOSE_COM(2)
END IF
```

- Call **CLOSE_COM (2)** to terminate communication and shut down the Bluetooth module.

➢ PAN

Follow the same programming flow of WLAN (802.11b) Example.

Note: Only one wireless network interface can be used at a time: 802.11b or PAN

➢ DUN-GPRS

To activate the GPRS functionality on a mobile phone via the built-in Bluetooth dial-up networking technology, follow the same programming flow of WLAN (802.11b) Example.

Before calling **START TCPIP(3)**, the following parameters of DUN-GPRS must be specified.

Index		Configuration Item	Remarks
-32	32	BT_GPRS_APNAME [20]	Name of Access Point for DUN-GPRS

5.21.7 GSM/GPRS

This section describes the BASIC functions and statements related to GSM/GPRS. Currently, these commands are for the use of the 8500 series.

GSM_CHANGE_PIN 8500

Purpose To change the PIN code.

Syntax *A%* = GSM_CHANGE_PIN(***old$***, ***new$***)

Remarks This command cannot be executed while the GSM/GPRS module is running. The old PIN string must be the password of facility. In this case, the new PIN code can be adopted and the remaining attempt counter of PIN will be reset to 3. If the old code is wrong, not only the password cannot be changed successfully, but also the counter will be decremented by 1.

"***A%***" is an integer variable assigned to the result.

A%	Meaning
1	PINCODE_PASSED
0	INVALID_PINCODE
-1	MODULE_RUNNING
-2	HARDWARE_ERR
-5	CONNECT_TIMEOUT

Example GSM_CHANGE_PIN(PIN1$,PIN2$) ' to change PIN code from PIN1 to PIN2.

See Also GSM_CHECK_PIN, GSM_SET_PINLOCK

GSM_CHECK_PIN 8500

Purpose To verify the PIN code.

Syntax *A%* = GSM_CHECK_PIN(***pin$***)

Remarks This command cannot be executed while the GSM/GPRS module is running. If the input code is the correct PIN code, the remaining attempt counter of PIN is reset to 3. If the old code is wrong, the counter will be decremented by 1.

"***A%***" is an integer variable assigned to the result.

A%	Meaning
2	PINCODE_UNNECESSARY
1	PINCODE_PASSED
0	INVALID_PINCODE

-1	MODULE_RUNNING
-2	HARDWARE_ERR
-6	PUK_REQUIRED

Example GSM_CHECK_PIN(PIN1$) ' to verify whether the PIN code is PIN1 or not

See Also GSM_CHANGE_PIN, GSM_SET_PINLOCK

GSM_SET_PINLOCK 8500

Purpose To set the PIN code lock.

Syntax ***A%*** = GSM_SET_PINLOCK(***pin$***, ***mode%***)

Remarks This command cannot be executed while the GSM/GPRS module is running. If the PIN code lock is already enabled (or disabled), one further enabling (or disabling) execution does not take effect.

For an unlocking process, the correct PIN code is required. Otherwise, the execution will fail and the remaining attempt counter of PIN will be decremented by 1. For a locking process, the old PIN code used before unlocking is required. Otherwise, the execution will fail and the counter will be decremented by 1.

"***A%***" is an integer variable assigned to the result.

A%	Meaning
1	PINCODE_PASSED
0	INVALID_PINCODE
-1	MODULE_RUNNING
-2	HARDWARE_ERR
-3	PINALREADY_LOCKED
-4	PINALREADY_UNLOCKED
-5	CONNECT_TIMEOUT
mode%	**Meaning**
0	Disable
1	Enable

Example GSM_SET_PINLOCK(PIN1$,1) ' to lock the PIN code

See Also GSM_CHANGE_PIN, GSM_CHECK_PIN

GPRS Example

To establish a connection to the content server connected to the internet, follow the same programming flow of WLAN (802.11b) Example. Only client-initiated connection is supported.

Before calling **START TCPIP(2)**, the following parameters of DUN-GPRS must be specified.

Index		**Configuration Item**	**Remarks**
-61	61	GSM_PIN_CODE [9]	PIN Code for GSM/GPRS
-62	62	GPRS_AP [21]	Name of Access Point for GPRS

Note: A client-initiated connection occurs when the connection is established in response to a request from the client.

GSM Example

Data services of GSM, including SMS (Short Message Service) and data call, are provided for receiving and sending data. They are performed via a virtual COM port, namely, COM3. The communication type, GSM_SMS and GSM_Modem, which are for SMS and data call respectively, should be assigned by calling **SET_COM_TYPE** before use.

The GSM_SMS supports uncompressed PDU (Protocol Description Unit) message mode. It can handle both 7-bit default alphabet and 8-bit data. In addition, concatenated messages are also supported.

- Call **SET_NET_PARAMETER** to set variables, such as PINCode[], ModemDialNum[], and so on.

  It is recommended that the correct PIN code should be initialized before opening the GSM port. This is because the PIN code will be taken as a password to activate the SIM card. Therefore, incorrect PIN code during initialization will result in wasting one attempt of PIN entry. If you fail the PIN entry three times, the procedure of PIN code entry will be locked.

- Call **SET_COM_TYPE (3, 6)** to set COM3 for SMS (GSM_SMS).

  Or call **SET_COM_TYPE (3, 7)** to set COM3 for data call (GSM_Modem).

- Call **OPEN_COM (3)** to initialize the GSM/GPRS module. The initialization takes about 10 seconds.

  An antenna icon representing the GSM operation will be displayed, and it keeps flashing until **OPEN_COM (3)** is completed.

For GSM_SMS only, once the procedure is completed, the signal strength bar will be displayed next to the antenna icon, and it will be updated every five seconds. The level of the signal strength bar ranges from 0 to 5.

Signal Bar	**RSSI Range**	
(Empty)	x < 10	(< -93 dbm)
▮	10 ≤ x < 12	(-93 ≤ x < -89 dbm)
▮▮	12 ≤ x < 15	(-89 ≤ x < -83 dbm)
▮▮▮	15 ≤ x < 18	(-83 ≤ x < -77 dbm)
▮▮▮▮	18 ≤ x < 21	(-77 ≤ x < -71 dbm)
▮▮▮▮▮	21 ≤ x	(-71 ≤ x)

The value of the PIN code will be fetched as a password required for initializing the operation.

Refer to the PIN/PUK procedure for handling PINCode[] errors. New PIN code re-entry and PUK unblock operation are furnished.

Once the PIN code check is passed, PINCode[] will be updated with appropriate value.

After **OPEN_COM (3)** is completed, relevant information will be obtained, such as SMServiceCenter[], NET[], and PINstatus.

Note: The POWER key will be disabled during connection process. Yet the [ESC] key is provided for being able to abort the PIN code check while connecting. A countermeasure, such as a time-out check, is recommended to prevent from waiting infinitely.

- Call **WRITE_COM (3, A$)** and **READ_COM$ (3)** to transmit and receive data respectively.
- Call **CLOSE_COM (3)** to terminate communication and shut down the GSM/GPRS module.

➢ READ_COM$ data format

For SMS service, the data format for single messages and concatenated messages is different.

The short messages will be removed from the SIM card after being read out.

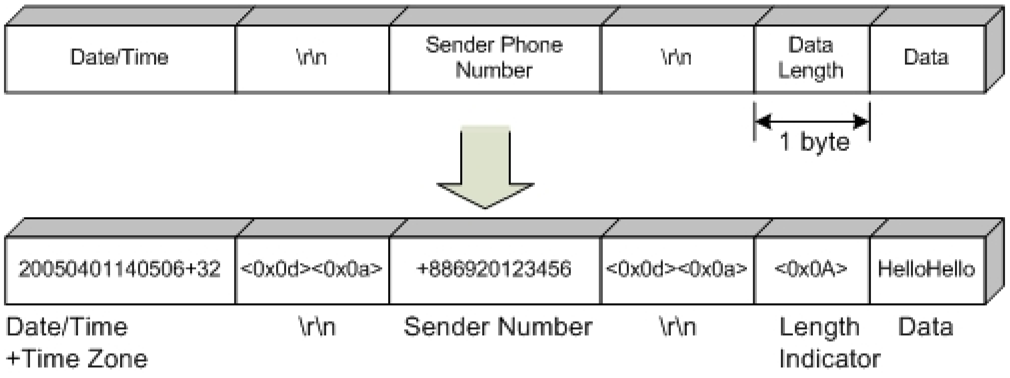
If it is necessary to save the received data, data storage structure like a DAT or DBF file is recommended.

Message Type	**Single Message**	**Concatenated Message**
Using 7-bit default alphabet	total length ≤ 160 characters	total length > 160 characters
Using 8-bit	total length ≤ 140 octets	total length > 140 octets
Using 16-bit	total length ≤ 70 characters	total length > 70 characters

- Single Message:

  The diagram below shows the data format for a single message received by calling **READ_COM$**. The data length is the number of octets of data.

  Example:
  20050401140506+32<0x0d><0x0a>+886920123456<0x0d><0x0a><0x0A>Hello Hello



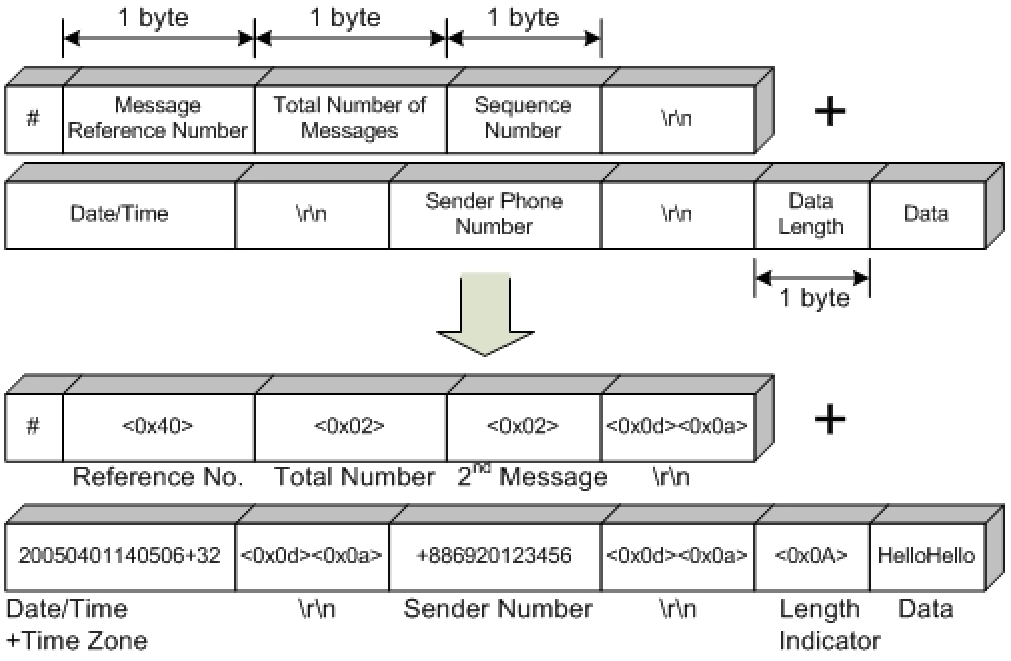
- Concatenated Message

  The whole data will be separated into several sections.

  The diagram below shows the data format for a concatenated message received by calling **READ_COM$**. The data length is the number of octets of data.

  Example:

#<0x40><0x02><0x02><0x0d><0x0a>20050401140506+32<0x0d><0x0a>+886 920123456<0x0d><0x0a><0x0A>HelloHello

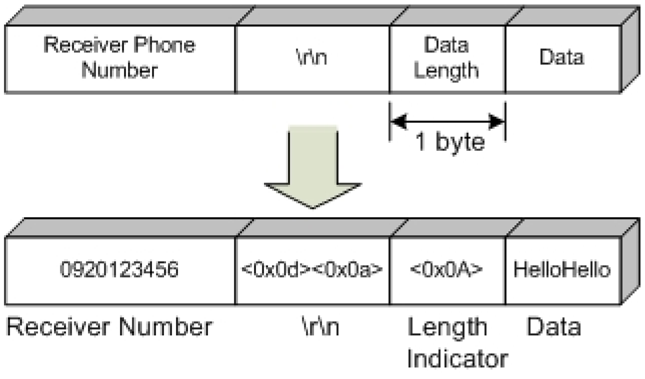


- **WRITE_COM data format**

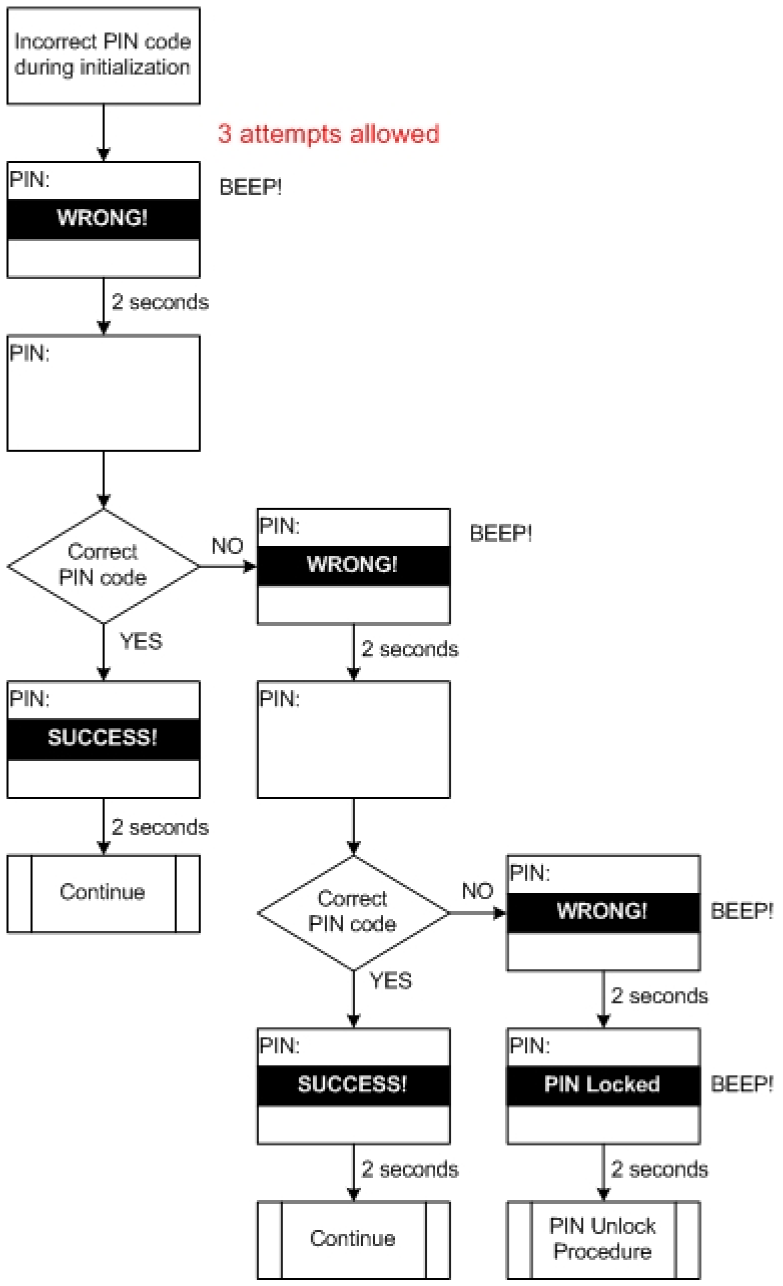
For sending a message, the maximum length is limited to 255 characters.

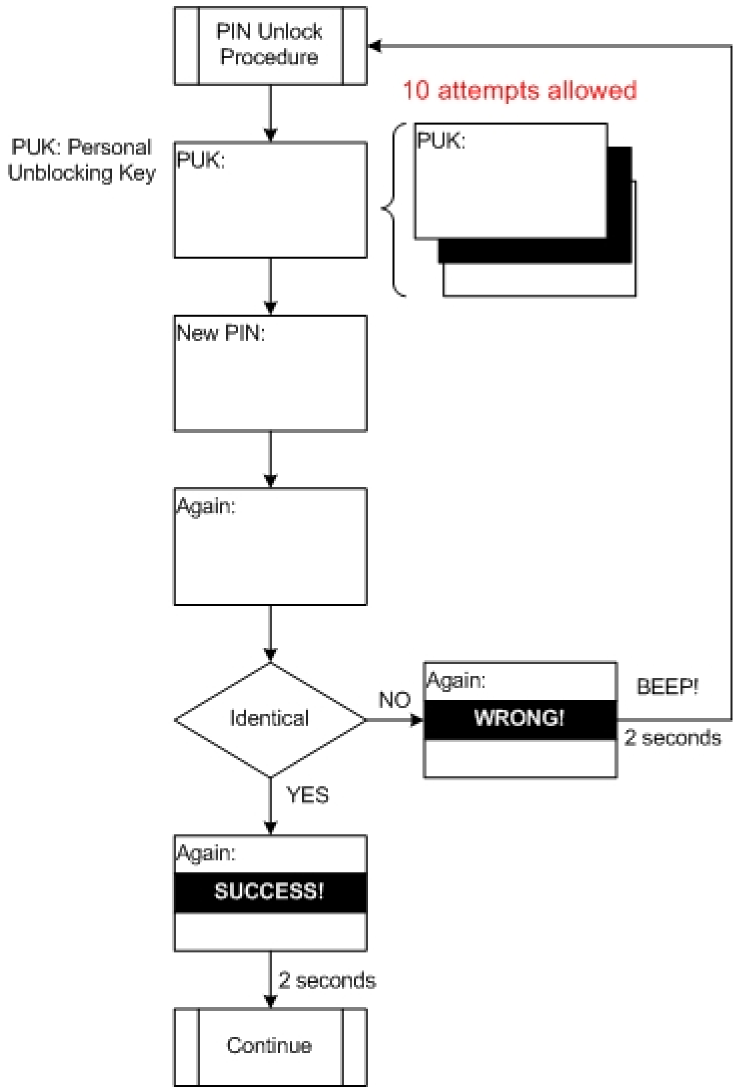
For long messages (see Message Type - Concatenated Message above), data will be sent successfully by using **NWRITE_COM**, and then each message will be separated into sections intentionally.

The data format for sending a message is as shown below. Example: 0920123456<0x0d><0x0a><0x0A>HelloHello



PIN/PUK Procedure




PIN Unlock Procedure
10 attempts allowed
PUK: Personal Unblocking Key
PUK:
PUK:
New PIN:
Again:
Identical
NO
Again:
WRONG!
BEEP!
2 seconds
YES
Again:
SUCCESS!
2 seconds
Continue

5.22 File Manipulation

This section describes the commands related to file manipulation. There are two different types of file structures supported in CipherLab BASIC.

- DAT Files
- DBF Files and IDX Files

5.22.1 DAT Files

This one has a sequential file structure, which is much like the ordinary sequential file but is modified to support FIFO structure. We call this type of file as DAT file. Because DAT files are usually used to store transaction data, they are also referred to as Transaction files.

Note: (1) The length of each record in the transaction file is limited to 255 bytes.
(2) For portable terminals, a BASIC program can have up to 6 transaction files.

DEL_TRANSACTION_DATA

Purpose To remove a block of transaction data from the default transaction file.

Syntax DEL_TRANSACTION_DATA(***N%***)

Remarks This command will only have an effect on the first (default) transaction file.

"***N%***" is an integer variable, determining how many transaction records to be deleted and how to delete.

If "***N%***" is a ***positive*** integer, the specified number of records will be deleted from the top of the transaction file 1, i.e. the oldest records will be deleted.

If "***N%***" is a ***negative*** integer, the specified number of records will be deleted from the bottom of the transaction file 1, i.e. the latest records will be deleted.

Example

```
  ...
  PRINT "Discard the latest transaction? (Y/N)"
  ...
Loop:
  KeyData$ = INKEY$
  IF KeyData$ = "" THEN
    GOTO Loop
  ELSE IF KeyData$ = "Y" THEN
    DEL_TRANSACTION_DATA(-1)
  END IF
  ...
```

See Also DEL_TRANSACTION_DATA_EX, EMPTY_TRANSACTION

DEL_TRANSACTION_DATA_EX

Purpose To remove a block of transaction data from a specified transaction file.

Syntax DEL_TRANSACTION_DATA_EX(***file%***, ***N%***)

Remarks "***file%***" is an integer variable in the range of 1 to 6, indicating which transaction file the command is to affect. The command DEL_TRANSACTION_DATA_EX(1, ***N%***) works the same as the command DEL_TRANSACTION_DATA(***N%***).

"***N%***" is an integer variable, determining how many transaction records to be deleted and how to delete.

If "***N%***" is a ***positive*** integer, the specified number of records will be deleted from the top of the transaction file 1, i.e. the oldest records will be deleted.

If "***N%***" is a ***negative*** integer, the specified number of records will be deleted from the bottom of the transaction file 1, i.e. the latest records will be deleted.

Example

```
  ...
  PRINT "Discard the latest transaction? (Y/N)"
  ...
Loop:
  KeyData$ = INKEY$
  IF KeyData$ = "" THEN
    GOTO Loop
  ELSE IF KeyData$ = "Y" THEN
    DEL_TRANSACTION_DATA_EX(TransFile%, -1)
  END IF
  ...
```

See Also DEL_TRANSACTION_DATA, EMPTY_TRANSACTION_EX

EMPTY_TRANSACTION

Purpose To remove all the transaction data from the default transaction file.

Syntax EMPTY_TRANSACTION

Remarks This command will only have an effect on the first (default) transaction file.

Note that if this function is called at the beginning of the program, data will be deleted after the battery is replaced or the System Menu is launched.

Example

```
  ...
  PRINT "Remove all the transaction data? (Y/N)"
  ...
Loop:
  KeyData$ = INKEY$
  IF KeyData$ = "" THEN
    GOTO Loop
  ELSE IF KeyData$ = "Y" THEN
    EMPTY_TRANSACTION
  END IF
  ...
```

See Also DEL_TRANSACTION_DATA, EMPTY_TRANSACTION_EX

EMPTY_TRANSACTION_EX

Purpose To remove all the transaction data from a specified transaction file.

Syntax EMPTY_TRANSACTION_EX(***file%***)

Remarks "***file%***" is an integer variable in the range of 1 to 6, indicating which transaction file the command is to affect. The command EMPTY_TRANSACTION_EX(1) works the same as the command EMPTY_TRANSACTION.

Note that if this function is called at the beginning of the program, data will be deleted after the battery is replaced or the System Menu is launched.

Example EMPTY_TRANSACTION_EX(6)

See Also DEL_TRANSACTION_DATA_EX, EMPTY_TRANSACTION

GET_TRANSACTION_DATA$

Purpose To read a transaction record from the default transaction file.

Syntax ***A$*** = GET_TRANSACTION_DATA$(***N%***)

Remarks "***A$***" is a string variable to be assigned to the transaction data.

"***N%***" is an integer variable, indicating the ordinal number of the record to be read from the first transaction file.

Example

```
  ...
WHILE (TRANSACTION_COUNT > 0)
  TransactionData$ = GET_TRANSACTION_DATA$(1)
  WRITE_COM(1, TransactionData$)
  DEL_TRANSACTION_DATA(1)
  WEND
```

See Also GET_TRANSACTION_DATA_EX$, SAVE_TRANSACTION, UPDATE_TRANSACTION

GET_TRANSACTION_DATA_EX$

Purpose To read a transaction record from a specified transaction file.

Syntax ***A$*** = GET_TRANSACTION_DATA_EX$(***file%***, ***N%***)

Remarks "***A$***" is a string variable to be assigned to the transaction data.

"***file%***" is an integer variable in the range of 1 to 6, indicating which transaction file to access. The command GET_TRANSACTION_DATA_EX$(1,1) works the same as the command GET_TRANSACTION_DATA$(1).

"***N%***" is an integer variable, indicating the ordinal number of the record to be read from the first transaction file.

Example

```
  ...
WHILE (TRANSACTION_COUNT > 0)
  TransactionData$ = GET_TRANSACTION_DATA_EX$(TransFile%,1)
  WRITE_COM(1, TransactionData$)
  DEL_TRANSACTION_DATA_EX(TransFile%,1)
  WEND
```

See Also GET_TRANSACTION_DATA$, SAVE_TRANSACTION_EX, UPDATE_TRANSACTION_EX

SAVE_TRANSACTION

Purpose To save (append) a transaction record to the default transaction file.

Syntax SAVE_TRANSACTION(***data$***)

Remarks "***data$***" is a string variable, representing the string to be saved in the first (default) transaction file.

Example

```
  ON READER(1) GOSUB BcrData_1
  ...
BcrData_1:
  Data$ = GET_READER_DATA$(1)
  PRINT Data$
  SAVE_TRANSACTION(Data$)
  IF GET_FILE_ERROR <> 0 THEN PRINT "Transaction not saved."
  RETURN
```

See Also GET_TRANSACTION_DATA$, SAVE_TRANSACTION_EX, UPDATE_TRANSACTION

SAVE_TRANSACTION_EX

Purpose To save (append) a transaction record to a specified transaction file.

Syntax SAVE_TRANSACTION_EX(***file%***, ***data$***)

Remarks "***file%***" is an integer variable in the range of 1 to 6, indicating which transaction file to access. The command SAVE_TRANSACTION_EX(1,data$) works the same as the command SAVE_TRANSACTION(data$).

"***data$***" is a string variable, representing the string to be saved in the specified transaction file.

Example

```
  ON READER(1) GOSUB BcrData_1
  ...
BcrData_1:
  BEEP(2000,5)
  Data$ = GET_READER_DATA$(1)
  PRINT Data$
  SAVE_TRANSACTION_EX(TransFile%,Data$)
  IF GET_FILE_ERROR <> 0 THEN PRINT "Transaction not saved."
  RETURN
```

See Also GET_TRANSACTION_DATA_EX$, SAVE_TRANSACTION, UPDATE_TRANSACTION_EX

TRANSACTION_COUNT

Purpose To get the total number of transaction records saved in the first (default) transaction file.

Syntax ***A%*** = TRANSACTION_COUNT

Remarks "***A%***" is an integer variable to be assigned to the result.

Example

```
  ...
DataCount:
  DataCount% = TRANSACTION_COUNT
  CLS
  PRINT DataCount%, "Transaction data is saved."
  RETURN
  ...
```

See Also TRANSACTION_COUNT_EX

TRANSACTION_COUNT_EX

Purpose To get the total number of transaction records saved in a specified transaction file.

Syntax ***A%*** = TRANSACTION_COUNT_EX(***file%***)

Remarks "***A%***" is an integer variable to be assigned to the result.

"***file%***" is an integer variable in the range of 1 to 6, indicating which transaction file to access. The command TRANSACTION_COUNT_EX(1) works the same as the command TRANSACTION_COUNT.

Example

```
 ...
DataCount_1:
 DataCount% = TRANSACTION_COUNT_EX(1)
 CLS
 PRINT DataCount%, "Data in transaction file 1."
 RETURN
 ...
```

See Also TRANSACTION_COUNT

UPDATE_TRANSACTION

Purpose To update a transaction record in the first (default) transaction file.

Syntax UPDATE_TRANSACTION(***N%***, ***data$***)

Remarks "***N%***" is an integer variable, indicating the ordinal number of the transaction record to be updated.

"***data$***" is a string variable, representing the character string to replace the old data.

Example

```
 ...
UpdateTransaction:
 UPDATE_TRANSACTION(Num%, NewData$)
 RETURN
 ...
```

See Also GET_TRANSACTION_DATA$, SAVE_TRANSACTION, UPDATE_TRANSACTION_EX

UPDATE_TRANSACTION_EX

Purpose To update a transaction record in a specified transaction file.

Syntax UPDATE_TRANSACTION_EX(***file%***, ***N%***, ***data$***)

Remarks "***file%***" is an integer variable in the range of 1 to 6, indicating which transaction file to access. The command UPDATE_TRANSACTION_EX(1, N%, data$) works the same as the command UPDATE_TRANSACTION(N%, data$).

"***N%***" is an integer variable, indicating the ordinal number of the transaction record to be updated.

"***data$***" is a string variable, representing the character string to replace the old data.

Example

```
 ...
UpdateTransaction_1:
 UPDATE_TRANSACTION_EX(1, Num%, NewData$)
 RETURN
 ...
```

See Also GET_TRANSACTION_DATA_EX$, SAVE_TRANSACTION_EX, UPDATE_TRANSACTION

5.22.2 DBF Files and IDX Files

This one is an index sequential file structure. Table look-up and report generation is easily supported by using index sequential file routines. There are actually two types of files associated with this file structure, namely, ***DBF*** files and ***IDX*** files.

A DBF file has a fixed record length structure. This is the file that stores the data records (members), whereas, the associated IDX files are the files that keep the information of the position of each record stored in the DBF file. Yet, such index files are re-arranged (sorted) according to some specific key values. In addition to the IDX files that are explicitly created by user, the BASIC run-time maintains a default IDX file which keeps the original data sequence.

Data records are not manipulated directly from the DBF file but rather through its associated IDX files. The value of file pointers of the IDX files (index pointers) does not represent the address of the data records stored in the DBF file. It indicates the sequence number of a specific data record in the IDX file.

A library would be a good example to illustrate how DBF and IDX files work. When you are trying to find a specific book in a library, you always start from the index. The book can be found by looking into the index categories of book title, writer, publisher, ISBN number, etc. All these index entries are sorted in ascending order for easy lookup according to some specific information of books (book title, writer, publisher, ISBN number, etc.) When the book is found in the index, it will tell you where the book is actually stored.

As you can see, the books kept in the library are analogous to the data records stored in the DBF file, and, the various index entries are just its associate IDX files. Some information (book title, writer, publisher, ISBN number, etc.) in the data records is used to create the IDX files.

Note: (1) The length of each record in the DBF file is limited to 250 bytes.
(2) For portable terminals, a BASIC program can have up to 5 DBF files. Each DBF file can have up to 3 associated IDX files, and each of them is identified by its key (index) number. The valid key numbers are from 1 to 3.

ADD_RECORD

Purpose To add a record to a specified DBF file.

Syntax ADD_RECORD(***file%***, ***data$***)

Remarks "***file%***" is an integer variable in the range of 1 to 5, indicating which DBF file to be accessed.

"***data$***" is a string variable, representing the character string which user intends to add to the specified DBF file.

Example

```
  ON COM(1) GOSUB Hostcommand
  ...
HostCommand:
  Cmd$ = READ_COM$(1)
  CmdIdentifier$ = LEFT$(Cmd$, 1)
  DBFNum% = VAL(MID$(Cmd$, 2, 1))
  CardID$ = RIGHT$(Cmd$, LEN(Cmd$)-2)
  IF CmdIdentifier$ = "+" THEN
    ADD_RECORD(DBFNum%, CardID$)
  ELSE
  ...
```

See Also DEL_RECORD

DEL_RECORD

Purpose To delete the record pointed by the file pointer in a specified DBF file.

Syntax DEL_RECORD(***file%*** [***,index%***])

Remarks "***file%***" is an integer variable in the range of 1 to 5, indicating which DBF file to be accessed.

"***index***%" is an integer variable in the range of 1 to 3, indicating which IDX file to be accessed. If it is not specified, then the default IDX file which keeps the original data sequence will be used.

For example, if DBF 1 contains four records: 011-231, 120-117, 043-010, 067-150. The key (index) of the first associate IDX file is defined as starting at position 1 with length of 3, and the key (index) of the second associate IDX file is defined as starting at position 5 with length of 3. All the file pointers of the DBF file and IDX files are currently pointing to the last record.

	DBF 1		**IDX 1**		**IDX 2**
	011-231		011-231		043-010
	120-117		043-010		120-117
	043-010		067-150		067-150
→	067-150	→	120-117	→	011-231

Then, DEL_RECORD(1) will delete 067-150, DEL_RECORD(1,1) will delete 120-117, DEL_RECORD(1,2) will delete 011-231.

Example

```
  ON COM(1) GOSUB HostCommand
  ...
HostCommand:
  Cmd$ = READ_COM$(1)
```

```
    CmdIdentifier$ = LEFT$(Cmd$, 1)
    DBFNum% = VAL(MID$(Cmd$, 2, 1))
    IDXNum% = VAL(MID$(Cmd$, 3, 1))
    CardID$ = RIGHT$(Cmd$, LEN(Cmd$)-3)
    IF CmdIdentifier$ = "-" THEN
       DEL_RECORD(DBFNum%, IDXNum%)
    ELSE
    ...
```

See Also ADD_RECORD, EMPTY_FILE

EMPTY_FILE

Purpose To remove all the records from a specified DBF file.

Syntax EMPTY_FILE(***file%***)

Remarks "***file%***" is an integer variable in the range of 1 to 5, indicating which DBF file to be accessed.

Note that if this function is called at the beginning of the program, data will be deleted after the battery is replaced or the System Menu is launched.

Example

```
    ON COM(1) GOSUB HostCommand
    ...
HostCommand:
    Cmd$ = READ_COM$(1)
    CmdIdentifier$ = LEFT$(Cmd$, 1)
    DBFNum% = VAL(MID$(Cmd$, 2, 1))
    IDXNum% = VAL(MID$(Cmd$, 3, 1))
    CardID$ = RIGHT$(Cmd$, LEN(Cmd$)-3)
    IF CmdIdentifier$ = "!" THEN
       EMPTY_FILE(DBFNum%)
    ELSE
    ...
```

See Also DEL_RECORD

FIND_RECORD

Purpose To search for records in a specified DBF file that matches the key string with respect to a specified IDX.

Syntax ***A%*** = FIND_RECORD(***file%***, ***index%***, ***key$***)

Remarks "***A%***" is an integer variable to be assigned to the result.

"***file%***" is an integer variable in the range of 1 to 5, indicating which DBF file to be accessed.

"***index%***" is an integer variable in the range of 1 to 3, indicating which IDX file to be accessed.

"***key$***" is a string variable, representing the character string which indicates the matching string to be found.

If any record member in the DBF file matches the key string with respect to the IDX file, FIND_RECORD will return 1, and the file pointer of the IDX file will point to the first record with the matching string.

If there is no match, the file pointer will point to the first record whose index value is greater than the vale of "***key$***".

Example

```
  ON COM(1) GOSUB HostCommand
  ...
HostCommand:
  Cmd$ = READ_COM$(1)
  CmdIdentifier$ = LEFT$(Cmd$, 1)
  DBFNum% = VAL(MID$(Cmd$, 2, 1))
  IDXNum% = VAL(MID$(Cmd$, 3, 1))
  CardID$ = RIGHT$(Cmd$, LEN(Cmd$)-3)
  IF CmdIdentifier$ = "?" THEN
    IF FIND_RECORD(DBFNum%, IDXNum%, CardID$) = 1 THEN
    PRINT "Data is found in DBF.", DBFNum%
    ELSE
    PRINT "Data is not found in DBF.", DBFNum%
    END IF
  ELSE
  ...
```

GET_RECORD$

Purpose To get a record in a specified DBF file, which the file pointer of a specified IDX file is pointing to.

Syntax ***A$*** = GET_RECORD(***file%*** [,***index%***])

Remarks "***A$***" is a string variable to be assigned to the result.

"***file%***" is an integer variable in the range of 1 to 5, indicating which DBF file to be accessed.

"***index%***" is an integer variable in the range of 1 to 3, indicating which IDX file to be accessed. If it is not specified, the default IDX file which keeps the original data sequence will be used.

Example

```
  ON COM(1) GOSUB BcrData_1
  ...
BcrData_1:
  BEEP(2000,5)
  ID$ = GET_READER_DATA$(1)
  IF FIND_RECORD(DBFNum%, IDXNum%, ID$) = 1 THEN
    Data$ = GET_RECORD$(DBFNum%, IDXNum%)
    Item$ = MID$(Data$, LEN(Data$)-IDLeng%-ItemLeng%)
    Note$ = RIGHT$(Data$, LEN(Data$)-IDLeng%-ItemLeng%)
    LOCATE 1,1
    PRINT "ID    :", Data$
    LOCATE 2,1
    PRINT "Item :", Item$
    LOCATE 3,1
    PRINT "Note :", Note$
  ELSE
  ...
```

See Also UPDATE_RECORD

GET_RECORD_NUMBER

Purpose To get the ordinal number of the record pointed to by the file pointer of a specified DBF file and IDX file.

Syntax ***A%*** = GET_RECORD_NUMBER(***file%*** [,***index%***])

Remarks "***A%***" is an integer variable to be assigned to the number.

"***file%***" is an integer variable in the range of 1 to 5, indicating which DBF file to be accessed.

"***index%***" is an integer variable in the range of 1 to 3, indicating which IDX file to be accessed. If it is not specified, the default IDX file which keeps the original data sequence will be used.

Example A% = GET_RECORD_NUMBER(1,1)

MOVE_TO

Purpose To move the file pointer, of a specified DBF and IDX files, to a specified position.

Syntax MOVE_TO(***file%*** [,***index%***], ***record_number%***)

Remarks "***file%***" is an integer variable in the range of 1 to 5, indicating which DBF file to be accessed.

"***index%***" is an integer variable in the range of 1 to 3, indicating which IDX file to be accessed. If it is not specified, the default IDX file which keeps the original data sequence will be used.

"***record_number%***" is a positive integer variable, indicating the ordinal number of the record where the file pointer is moved to.

Example MOVE_TO(1,1,20)

See Also MOVE_TO_NEXT, MOVE_TO_PREVIOUS

MOVE_TO_NEXT

Purpose To move the file pointer, of a specified DBF and IDX files, one record forward.

Syntax MOVE_TO_NEXT(***file%*** [,***index%***])

Remarks "***file%***" is an integer variable in the range of 1 to 5, indicating which DBF file to be accessed.

"***index%***" is an integer variable in the range of 1 to 3, indicating which IDX file to be accessed. If it is not specified, the default IDX file which keeps the original data sequence will be used.

Example MOVE_TO_NEXT(1,1)

See Also MOVE_TO, MOVE_TO_PREVIOUS

MOVE_TO_PREVIOUS

Purpose To move the file pointer, of a specified DBF and IDX files, one record backward.

Syntax MOVE_TO_PREVIOUS(***file%*** [,***index%***])

Remarks "***file%***" is an integer variable in the range of 1 to 5, indicating which DBF file to be accessed.

"***index%***" is an integer variable in the range of 1 to 3, indicating which IDX file to be accessed. If it is not specified, the default IDX file which keeps the original data sequence will be used.

Example MOVE_TO_PREVIOUS(1,1)

See Also MOVE_TO, MOVE_TO_NEXT

RECORD_COUNT

Purpose To get the total number of the records in a specified DBF file.

Syntax ***A%*** = RECORD_COUNT(***file%***)

Remarks "***A%***" is an integer variable to be assigned to the result.

"***file%***" is an integer variable in the range of 1 to 5, indicating which DBF file to be accessed.

Example TotalRecord_1% = RECORD_COUNT(1)

UPDATE_RECORD

Purpose To update the record, which the file pointer of a specified DBF and IDX files is pointing to.

Syntax UPDATE_RECORD(***file%***, ***index%***, ***data$***)

Remarks "***file%***" is an integer variable in the range of 1 to 5, indicating which DBF file to be accessed.

"***index%***" is an integer variable in the range of 1 to 3, indicating which IDX file to be accessed. If it is not specified, the default IDX file which keeps the original data sequence will be used.

"***data$***" is a string variable, representing the character string to replace the old data.

Example

```
  ON COM(1) GOSUB HostCommand
  ...
HostCommand:
  Cmd$ = READ_COM$(1)
  CmdIdentifier$ = LEFT$(Cmd$, 1)
  DBFNum% = VAL(MID$(Cmd$, 2, 1))
  IDXNum% = VAL(MID$(Cmd$, 3, 1))
  CardID$ = RIGHT$(Cmd$, LEN(Cmd$)-3)
  IF CmdIdentifier$ = "&" THEN
    UPDATE_RECORD(DBFNum%, IDXNum%, CardID$)
  ELSE
  ...
```

See Also GET_RECORD$

5.22.3 Error Code

The command GET_FILE_ERROR returns the error code, which is a number that indicates the result of the last file manipulation. A value other than 0 indicates error.

GET_FILE_ERROR

Purpose To get the error code of the previous file manipulation command.

Syntax ***A%*** = GET_FILE_ERROR

Remarks "***A%***" is an integer variable to be assigned to the result.

If there is no error, it returns 0.

If it returns a value other than 0, possible error code and its interpretation will be listed as follows.

Error Code	**Interpretation**
10	No free memory for file extension.

For other types of error, e.g. invalid file ID, it will cause a run-time error.

Example

```
...
ADD_RECORD(1,Data$)
IF (GET_FILE_ERROR = 10) THEN
   ErrorMessage$ = "No free file space."
END IF
...
```

5.23 Memory Commands

This section describes the commands related to the flash memory and SRAM, where the Program Manager and File System reside respectively.

The terminal has at least 1 MB flash memory for program storage and up to 4 MB SRAM for data storage. However, the flash memory also serves to store crucial user data, such as the application settings. One memory bank with specific address 0xF60000 ~ 0xF6FFFF is reserved for this purpose.

Note: Currently, only the 8000/8500 series has 2 MB flash memory.

5.23.1 Flash

The flash memory is divided into a number of memory banks, and each bank is 64 KB.

- If 1 MB, it is divided into 16 banks. (711/8100/8300)
- If 2 MB, it is divided into 32 banks. (8000/8500)

The kernel itself takes 2 banks, and the system reserves 1 bank (0xF60000 ~ 0xF6FFFF) for data storage, such as the application settings. The rest banks are available for storing user programs as well as font files.

Because the flash memory is non-volatile, it needs to be erased before writing to the same bank, 0xF60000 ~ 0xF6FFFF. This memory bank is further divided into 256 records, numbering from 1 ~ 256 and each with length limited to 255 bytes.

Note: The flash memory can only be erased on a bank basis, that is, all the records stored in 0xF60000 ~ 0xF6FFFF will be gone.

FLASH_READ$

Purpose To read a data string from the memory bank 0xF60000 ~ 0xF6FFFF.

Syntax ***A$*** = FLASH_READ$(***N%***)

Remarks "***A$***" is a string variable to be assigned to the result.

"***N%***" is an integer variable in the range of 1 to 256, indicating the ordinal number of the record.

Example A$ = FLASH_READ$(3) ' read the 3rd record

See Also FLASH_WRITE

FLASH_WRITE

Purpose To write a data string to the memory bank 0xF60000 ~ 0xF6FFFF.

Syntax ***A%*** = FLASH_WRITE(***N%***, ***A$***)

Remarks Up to 256 records can be saved.

"***A%***" is an integer variable to be assigned to the result.

A%	Meaning
1	Write flash memory successfully.
-1	The BASIC program is too large; no free flash memory available.
-2	Error command for erasing the flash memory.
-3	The given index is out of the range.
-4	Fail to write (probably flash memory is not erased yet or something goes wrong).

"***N%***" is an integer variable in the range of 1 to 256, indicating the ordinal number of the record.

"***A$***" is a string variable, representing the data string to be saved.

Before writing data to any used record, it is necessary to use the following command to erase the memory bank first:

err% = FLASH_WRITE(0,"ERASE")

Note that the record number must be 0, and the string must be "ERASE".

After erasing the whole memory bank, you can then write data to it by one record at a time. Be aware that whenever you need to write data to any used record, the whole memory bank needs to be erased; otherwise, this command will fail.

Example

```
err% = FLASH_WRITE(1, "data number#1)
...
err% = FLASH_WRITE(256, "data number#256)
```

See Also FLASH_READ$

ROM_SIZE

Purpose To get the size of the whole flash memory in kilo-bytes.

Syntax ***A%*** = ROM_SIZE

Remarks "***A%***" is an integer variable to be assigned to the result.

Example PRINT "Flash size = ", ROM_SIZE

See Also FREE_MEMORY, RAM_SIZE

5.23.2 SRAM

The File System keeps user data in SRAM, which is maintained by the backup battery. However, data loss may occur during low battery condition or when the battery is drained. It is necessary to upload data to a host computer before putting away the terminal.

FREE_MEMORY

Purpose	To get the size of free data memory (SRAM) in bytes.
Syntax	***A&*** = FREE_MEMORY
Remarks	"***A&***" is a long integer variable to be assigned to the result.
Example	PRINT "Free memory = ", FREE_MEMORY
See Also	RAM_SIZE, ROM_SIZE

RAM_SIZE

Purpose	To get the size of the whole data memory (SRAM) in kilo-bytes.
Syntax	***A%*** = RAM_SIZE
Remarks	"***A%***" is an integer variable to be assigned to the result.
Example	PRINT "SRAM size = ", RAM_SIZE
See Also	FREE_MEMORY, ROM_SIZE

5.24 Debugging Commands

The command **START_DEBUG** will write the activities happening on the system to a specified COM port. It is very useful when user needs to monitor the system or diagnose a problem.

When **START_DEBUG** is executed, the system will send a series of messages to a specified COM port until the command **STOP_DEBUG** is executed. The following is a list of the debug messages received when running a sample BASIC program.

Note: Please refer to Appendix III for a description of the debug messages.

```
*  L(7), T(0)
   ADD_RECORD(1,"10001 Justin Jan
   08300930113013001130150018002000")
*  L(8), T(0)
*  L(9), T(0)
   ASGN(2)
*  L(10), T(0)
   ASGN(3)
*  L(11), T(0)
   ASGN("CipherLab 510")
*  L(12), T(0)
   ASGN("510AC_100.BAS")
*  L(13), T(0)
   ...
*  L(25), T(0)
   ARY(1)
   ASGN("OKGood Morning!    ")
   ...
*  L(39), T(0)
   SET_COM(1,1,1,2,1)
*  L(40), T(0)
   OPEN_COM(1)
   ...
*  L(41), T(0)
   START_NETWORK
```

```
*  L(42), T(0)
   ON_NET(316)

*  L(43), T(0)
   ON_ENQUIRY(128)
   ...
*  GOTO(68)
   L(68), T(0)
*  L(69), T(0)
*  L(70), T(0)
   GOTO(68)
   ...
*  L(69), T(0)
   EVENT(16)
*  L(79), T(1)
*  L(80), T(1)
   OFF_READER(1)
*  L(81), T(1)
   OFF_READER(2)
*  L(82), T(1)
   CLS
*  L(83), T(1)
   HIDE_CALENDAR
*  L(84), T(1)
   BEEP(...)
```

START_DEBUG

Purpose To start the debug function.

Syntax START_DEBUG(***N%***, ***Baudrate%***, ***Parity%***, ***Data%***, ***Handshake%***)

Remarks

Parameters	Values	Remarks
N%	1 or 2	Indicates which COM port is to be set.
Baudrate%	1: 115200 bps 2: 76800 bps 3: 57600 bps 4: 38400 bps 5: 19200 bps 6: 9600 bps 7: 4800 bps 8: 2400 bps	Specifies the baud rate of the COM port.
Parity%	1: None 2: Odd 3: Even	Specifies the parity of the COM port.
Data%	1: 7 data bits 2: 8 data bits	Specifies the data bits of the COM port.
Handshake%	1: None 2: CTS/RTS 3: XON/XOFF	Specifies the method of flow control for the COM port.

If a certain COM port has been used in the BASIC program, it is better to use another COM port for debugging to avoid conflicts.

Example

```
START_DEBUG (1,1,1,2,1)          ' use COM1 to send debug messages
                                 ' the COM port properties are 115200,
                                 None, 8, No handshake
```

See Also STOP_DEBUG

STOP_DEBUG

Purpose To terminate the debug function.

Syntax STOP_DEBUG

Remarks This is the counter command of START_DEBUG.

Example STOP_DEBUG

See Also START_DEBUG

5.25 Reserved Host Commands

There are some commands reserved for the host computer to read/remove data of the transaction file, or to adjust the system time. User's BASIC program does not need to do any processing because these tasks will be processed by the background routines of the BASIC run-time.

Note: Each reserved command is ended with a carriage return, which can be changed by COM_DELIMITER. If any format error occurs, the terminal would return "NAK".

CLEAR

Purpose To erase data of a specified transaction file.

Syntax ***A$*** = CLEAR

A$ = CLEAR ***file%***

Remarks The command CLEAR will clear data of the first transaction file, which is the default one.

"***A$***" is a string variable to be assigned to the result.

A$	Meaning
OK	The command is processed successfully.
NAK	Any format error occurs.

"***file%***" is an integer variable in the range of 1 to 6, indicating which transaction file is to be erased.

Example CLEAR3 ' to delete data of the 3rd transaction file

See Also REMOVE

READ

Purpose To read the top most record of a specified transaction file.

Syntax ***A$*** = READ

A$ = READ ***file%***

Remarks The command READ will read the top most record of the first transaction file, which is the default one.

"***A$***" is a string variable to be assigned to the result; it may be the desired data string if the command is successfully processed.

Otherwise, it may have one of the values as follows:

A$	Meaning
OVER	There is no data in the transaction file.
NAK	Any format error occurs.

"***file%***" is an integer variable in the range of 1 to 6, indicating of which transaction file the record is to be read.

Example READ1 ' to read a record from the first transaction file

REMOVE

Purpose To delete one record from the top of a specified transaction file.

Syntax ***A$*** = REMOVE

A$ = REMOVE ***file%***

Remarks The command REMOVE will delete one record from the top of the first transaction file, which is the default one.

"***A$***" is a string variable to be assigned to the result.

A$	Meaning
NEXT	The command is processed successfully.
OVER	There is no more data.
NAK	Any format error occurs.

"***file%***" is an integer variable in the range of 1 to 6, indicating of which transaction file the record is to be deleted.

Example REMOVE2 ' to delete a record from the 2nd transaction file

See Also CLEAR

TR

Purpose To get the current system time.

Syntax ***A$*** = TR

Remarks "***A$***" is a string variable to be assigned to the result, which is in the form of "yyyymmddhhnnss".

Otherwise, it returns NAK for any format error.

Example TR

See Also TW

TW

Purpose To set new system time.

Syntax ***A$*** = TWyyyymmddhhnnss

Remarks "***A$***" is a string variable to be assigned to the result.

A$	**Meaning**
OK	The command is processed successfully.
NAK	Any format error occurs.

Format of system time:

yyyy:	4 digits for year
mm:	2 digits for month
dd:	2 digits for day
hh:	2 digits for hour, in 24-hour format
nn:	2 digits for minute
ss:	2 digits for second

Example

```
TW20050520103000                    ' set system time as 2005/May
                                    20/10:30:00
```

See Also TR

APPENDIX I

Reader Settings

Symbology Parameter Table I

No. (N1%)	Values and Description (N2%)	Scan Engine
1	0: Disable Code 39 1: Enable Code 39	CCD, Laser
2	0: Disable Italian Pharmacode 1: Enable Italian Pharmacode	CCD, Laser
3	0: Disable CIP 39 (= French Pharmacode) 1: Enable CIP 39	CCD, Laser
4	0: Disable Industrial 25 1: Enable Industrial 25	CCD, Laser
5	0: Disable Interleaved 25 1: Enable Interleaved 25	CCD, Laser
6	0: Disable Matrix 25 1: Enable Matrix 25	CCD, Laser
7	0: Disable Codabar (NW7) 1: Enable Codabar (NW7)	CCD, Laser
8	0: Disable Code 93 1: Enable Code 93	CCD, Laser
9	0: Disable Code 128 / EAN-128 1: Enable Code 128 / EAN-128	CCD, Laser
10	0: Disable UPC-E 1: Enable UPC-E	CCD, Laser
11	0: Disable UPC-E Addon 2 1: Enable UPC-E Addon 2	CCD, Laser
12	0: Disable UPC-E Addon 5 1: Enable UPC-E Addon 5	CCD, Laser

13	0: Disable EAN-8 1: Enable EAN-8	CCD, Laser
14	0: Disable EAN-8 Addon 2 1: Enable EAN-8 Addon 2	CCD, Laser
15	0: Disable EAN-8 Addon 5 1: Enable EAN-8 Addon 5	CCD, Laser
16	0: Disable EAN-13 / UPC-A 1: Enable EAN-13 / UPC-A	CCD, Laser
17	0: Disable EAN-13/UPC-A Addon 2 1: Enable EAN-13/UPC-A Addon 2	CCD, Laser
18	0: Disable EAN-13/UPC-A Addon 5 1: Enable EAN-13/UPC-A Addon 5	CCD, Laser
19	0: Disable MSI 1: Enable MSI	CCD, Laser
20	0: Disable Plessey 1: Enable Plessey	CCD, Laser
21	Reserved	---
22	0: DO NOT transmit Code 39 Start/Stop Character 1: Transmit Code 39 Start/Stop Character	CCD, Laser
23	0: DO NOT verify Code 39 Check Digit 1: Verify Code 39 Check Digit	CCD, Laser
24	0: DO NOT transmit Code 39 Check Digit 1: Transmit Code 39 Check Digit	CCD, Laser
25	0: Standard Code 39 1: Full ASCII Code 39	CCD, Laser
26	0: DO NOT transmit Italian Pharmacode Check Digit 1: Transmit Italian Pharmacode Check Digit	CCD, Laser
27	0: DO NOT transmit CIP 39 Check Digit 1: Transmit CIP 39 Check Digit	CCD, Laser
28	0: DO NOT verify Interleaved 25 Check Digit 1: Verify Interleaved 25 Check Digit	CCD, Laser
29	0: DO NOT transmit Interleaved 2 Check Digit 1: Transmit Interleaved 25 Check Digit	CCD, Laser
30	0: DO NOT verify Industrial 25 Check Digit 1: Verify Industrial 25 Check Digit	CCD, Laser

31	0: DO NOT transmit Industrial 25 Check Digit 1: Transmit Industrial 25 Check Digit	CCD, Laser
32	0: DO NOT verify Matrix 25 Check Digit 1: Verify Matrix 25 Check Digit	CCD, Laser
33	0: DO NOT transmit Matrix 25 Check Digit 1: Transmit Matrix 25 Check Digit	CCD, Laser
34	Select Interleaved 25 Start/Stop Pattern 0: Use Industrial 25 Start/Stop Pattern 1: Use Interleaved 25 Start/Stop Pattern 2: Use Matrix 25 Start/Stop Pattern	CCD, Laser
35	Select Industrial 25 Start/Stop Pattern 0: Use Industrial 25 Start/Stop Pattern 1: Use Interleaved 25 Start/Stop Pattern 2: Use Matrix 25 Start/Stop Pattern	CCD, Laser
36	Select Matrix 25 Start/Stop Pattern 0: Use Industrial 25 Start/Stop Pattern 1: Use Interleaved 25 Start/Stop Pattern 2: Use Matrix 25 Start/Stop Pattern	CCD, Laser
37	Select Codabar Start/Stop Character 0: abcd/abcd 1: abcd/tn*e 2: ABCD/ABCD 3: ABCD/TN*E	CCD, Laser
38	0: DO NOT transmit Codabar Start/Stop Character 1: Transmit Codabar Start/Stop Character	CCD, Laser
39	MSI Check Digit Verification 0: Single Modulo 10 1: Double Modulo 10 2: Modulo 11 and Modulo 10	CCD, Laser
40	MSI Check Digit Transmission 0: Last Check Digit is NOT transmitted 1: Both Check Digits are transmitted 2: Both Check Digits are NOT transmitted	CCD, Laser
41	0: DO NOT transmit Plessey Check Digits 1: Transmit Plessey Check Digits	CCD, Laser

42	0: No conversion 1: Convert Standard Plessey to UK Plessey	CCD, Laser
43	0: No conversion 1: Convert UPC-E to UPC-A	CCD, Laser
44	0: No conversion 1: Convert UPC-A to EAN-13	CCD, Laser
45	0: No conversion 1: Enable ISBN Conversion	CCD, Laser
46	0: No conversion 1: Enable ISSN Conversion	CCD, Laser
47	0: DO NOT transmit UPC-E Check Digit 1: Transmit UPC-E Check Digit	CCD, Laser
48	0: DO NOT transmit UPC-A Check Digit 1: Transmit UPC-A Check Digit	CCD, Laser
49	0: DO NOT transmit EAN-8 Check Digit 1: Transmit EAN-8 Check Digit	CCD, Laser
50	0: DO NOT transmit EAN-13 Check Digit 1: Transmit EAN-13 Check Digit	CCD, Laser
51	0: DO NOT transmit UPC-E System Number 1: Transmit UPC-E System Number	CCD, Laser
52	0: DO NOT transmit UPC-A System Number 1: Transmit UPC-A System Number	CCD, Laser
53	0: No conversion 1: Convert EAN-8 to EAN-13	CCD, Laser
54	Reserved	---
55	0: Disable Negative Barcode 1: Enable Negative Barcode	CCD, Laser
56	0: No Read Redundancy for Scanner Port 1 1: One Time Read Redundancy for Scanner Port 1 2: Two Times Read Redundancy for Scanner Port 1 3: Three Times Read Redundancy for Scanner Port 1	CCD, Laser
57	(Not for portable terminals.)	---
58	0: Industrial 25 Code Length Limitation in Fixed Length Format 1: Industrial 25 Code Length Limitation in Max/Min Length Format	CCD, Laser

59	Industrial 25 Max Code Length / Fixed Length 1	CCD, Laser
60	Industrial 25 Min Code Length / Fixed Length 2	CCD, Laser
61	0: Interleaved 25 Code Length Limitation in Fixed Length Format 1: Interleaved 25 Code Length Limitation in Max/Min Length Format	CCD, Laser
62	Interleaved 25 Max Code Length / Fixed Length 1	CCD, Laser
63	Interleaved 25 Min Code Length / Fixed Length 2	CCD, Laser
64	0: Matrix 25 Code Length Limitation in Fixed Length Format 1: Matrix 25 Code Length Limitation in Max/Min Length Format	CCD, Laser
65	Matrix 25 Max Code Length / Fixed Length 1	CCD, Laser
66	Matrix 25 Min Code Length / Fixed Length 2	CCD, Laser
67	0: MSI 25 Code Length Limitation in Fixed Length Format 1: MSI 25 Code Length Limitation in Max/Min Length Format	CCD, Laser
68	MSI Max Code Length / Fixed Length 1	CCD, Laser
69	MSI Min Code Length / Fixed Length 2	CCD, Laser
70	Scan Mode for Scanner Port 1 0: Auto Off Mode 1: Continuous Mode 2: Auto Power Off Mode 3: Alternate Mode 4: Momentary Mode 5: Repeat Mode 6: Laser Mode 7: Test Mode 8: Aiming Mode	CCD, Laser
71	(Not for portable terminals.)	---
72	Scanner Time-out Duration in seconds for Scanner Port 1: applicable to Aiming mode, Laser mode, Auto Off mode, and Auto Power Off mode.	CCD, Laser
73	(Not for portable terminals.)	---
74	0: Disable RSS Limited 1: Enable RSS Limited	CCD, Laser
75	0: Disable RSS Expanded 1: Enable RSS Expanded	CCD, Laser
76	0: Disable RSS-14 1: Enable RSS-14	CCD, Laser

77	0: DO NOT transmit RSS-14 Code ID 1: Transmit RSS-14 Code ID	CCD, Laser
78	0: DO NOT transmit RSS-14 Application ID 1: Transmit RSS-14 Application ID	CCD, Laser
79	0: DO NOT transmit RSS-14 Check Digit 1: Transmit RSS-14 Check Digit	CCD, Laser
80	0: DO NOT transmit RSS Limited Code ID 1: Transmit RSS Limited Code ID	CCD, Laser
81	0: DO NOT transmit RSS Limited Application ID 1: Transmit RSS Limited Application ID	CCD, Laser
82	0: DO NOT transmit RSS Limited Check Digit 1: Transmit RSS Limited Check Digit	CCD, Laser
83	0: DO NOT transmit RSS Expanded Code ID 1: Transmit RSS Expanded Code ID	CCD, Laser
84	0: Disable original Telepen 1: Enable original Telepen (Numeric)	CCD, Laser
85	0: Disable Telepen 1: Enable Telepen	CCD, Laser
86	0: Enable UPC-E0 1: Enable UPC-E1 / UPC-E0	CCD, Laser
87	0: Disable GTIN 1: Enable GTIN	CCD, Laser
88~147	N/A	---
148	0: Disable UPC-E1 Triple Check 1: Enable UPC-E1 Triple Check	CCD, Laser

Symbology Parameter Table II

Note: Those marked with asterisks (*) are further explained in each symbology of Appendix II.

No. (N1%)	Values and Description (N2%)	Scan Engine
1	0: Disable Code 39 1: Enable Code 39	2D, (Extra) Long Range
2	0: Disable Code 32 (= Italian Pharmacode) 1: Enable Code 32	2D, (Extra) Long Range
3	N/A	---
4	N/A	---
5	0: Disable Interleaved 25 1: Enable Interleaved 25	2D, (Extra) Long Range
6	N/A	---
7	0: Disable Codabar (NW7) 1: Enable Codabar (NW7)	2D, (Extra) Long Range
8	0: Disable Code 93 1: Enable Code 93	2D, (Extra) Long Range
9	0: Disable Code 128 1: Enable Code 128	2D, (Extra) Long Range
10	0: Disable UPC-E0 (depends) 1: Enable UPC-E0*	2D, (Extra) Long Range
13	0: Disable EAN-8 (depends) 1: Enable EAN-8*	2D, (Extra) Long Range
16	0: Disable EAN-13 (depends) 1: Enable EAN-13*	2D, (Extra) Long Range
11 or 12 or 14 or 15 or 17 or 18 or 107 or 109	0: Disable Only Addon 2 & 5 of UPC & EAN Families (It requires "ALL" of the indexes to be set 0.) 1: Enable Only Addon 2 & 5 of UPC & EAN Families* (It requires "ANY" of the indexes to be set 1.)	2D, (Extra) Long Range
19	0: Disable MSI 1: Enable MSI	2D, (Extra) Long Range
20	N/A	---

21	Reserved	---
22	N/A	---
23	0: DO NOT verify Code 39 Check Digit 1: Verify Code 39 Check Digit	2D, (Extra) Long Range
24	0: DO NOT transmit Code 39 Check Digit 1: Transmit Code 39 Check Digit	2D, (Extra) Long Range
25	0: Standard Code 39 1: Full ASCII Code 39	2D, (Extra) Long Range
26	N/A	---
27	N/A	---
28	N/A	---
29	0: DO NOT transmit Interleaved 25 Check Digit 1: Transmit Interleaved 25 Check Digit	2D, (Extra) Long Range
30	N/A	---
31	N/A	---
32	N/A	---
33	N/A	---
34	N/A	---
35	N/A	---
36	N/A	---
37	N/A	---
38	0: DO NOT transmit Codabar Start/Stop Character 1: Transmit Codabar Start/Stop Character	2D, (Extra) Long Range
39	MSI Check Digit Verification 0: Single Modulo 10 1: Double Modulo 10 2: Modulo 11 and Modulo 10	2D, (Extra) Long Range
40	MSI Check Digit Transmission 0: Last Check Digit is NOT transmitted 1: Both Check Digits are transmitted 2: Both Check Digits are NOT transmitted	2D, (Extra) Long Range
41	N/A	---
42	N/A	---
43	0: No conversion 1: Convert UPC-E0 to UPC-A	2D, (Extra) Long Range

44	N/A	---
45	N/A	---
46	N/A	---
47	0: DO NOT transmit UPC-E0 Check Digit 1: Transmit UPC-E0 Check Digit	2D, (Extra) Long Range
48	0: DO NOT transmit UPC-A Check Digit 1: Transmit UPC-A Check Digit	2D, (Extra) Long Range
49	N/A	---
50	N/A	---
51	0: DO NOT transmit UPC-E0 System Number 1: Transmit UPC-E0 System Number	2D, (Extra) Long Range
52	0: DO NOT transmit UPC-A System Number 1: Transmit UPC-A System Number	2D, (Extra) Long Range
53	0: No conversion 1: Convert EAN-8 to EAN-13	2D, (Extra) Long Range
54	N/A	---
55	N/A	---
56	N/A	---
57	(Not for portable terminals.)	---
58	N/A	---
59	N/A	---
60	N/A	---
61	0: Interleaved 25 Code Length Limitation in Fixed Length Format 1: Interleaved 25 Code Length Limitation in Max/Min Length Format	2D, (Extra) Long Range
62	Interleaved 25 Max Code Length / Fixed Length 1	2D, (Extra) Long Range
63	Interleaved 25 Min Code Length / Fixed Length 2 *(Length1 must be greater than Length2)	2D, (Extra) Long Range
64	N/A	---
65	N/A	---
66	N/A	---
67	0: MSI 25 Code Length Limitation in Fixed Length Format 1: MSI 25 Code Length Limitation in Max/Min Length Format	2D, (Extra) Long Range

68	MSI Max Code Length / Fixed Length 1	2D, (Extra) Long Range
69	MSI Min Code Length / Fixed Length 2 *(Length1 must be greater than Length2)	2D, (Extra) Long Range
70	Scan Mode for Scanner Port 1 8: Aiming Mode Any value (0~15) other than 8: Laser Mode (= aiming beam disabled)	(Extra) Long Range
71	N/A	---
72	N/A	---
73	N/A	---
74	N/A	---
75	N/A	---
76	N/A	---
77	N/A	---
78	N/A	---
79	N/A	---
80	N/A	---
81	N/A	---
82	N/A	---
83	N/A	---
84	N/A	---
85	N/A	---
86	N/A	---
87	N/A	---
88	0: Code 39 Length Limitation in Fixed Length Format 1: Code 39 Length Limitation in Max/Min Length Format	2D, (Extra) Long Range
89	Code 39 Max Code Length / Fixed Length1	2D, (Extra) Long Range
90	Code 39 Min Code Length / Fixed Length2 *(Length1 must be greater than Length2)	2D, (Extra) Long Range
91	0: DO NOT transmit UPC-E1 System Number 1: Transmit UPC-E1 System Number	2D, (Extra) Long Range
92	0: DO NOT transmit UPC-E1 Check Digit 1: Transmit UPC-E1 Check Digit	2D, (Extra) Long Range

93	0 : Disable UCC/EAN Code 128 Emulation Mode for UCC/EAN Composite Code 1 : Enable UCC/EAN Code 128 Emulation Mode for UCC/EAN Composite Code	2D
94	0: Disable TCIF Linked Code 39 1: Enable TCIF Linked Code 39	2D
95	0: No conversion 1: Convert UPC-E1 to UPC-A	2D, (Extra) Long Range
96	0: Disable Code 11 1: Enable Code 11	2D
97	0: Disable Bookland EAN 1: Enable Bookland EAN* (Index No. 16 is required to be 1.)	2D, (Extra) Long Range
98	0: Disable Discrete 25 (= Industrial 25) 1: Enable Discrete 25	2D, (Extra) Long Range
99	0: Disable ISBT 128 1: Enable ISBT 128	2D, (Extra) Long Range
100	0: Disable Trioptic Code 39 1: Enable Trioptic Code 39	2D, (Extra) Long Range
101	0: Disable UCC/EAN-128 1: Enable UCC/EAN-128	2D, (Extra) Long Range
102	0: No conversion 1: Convert RSS to UPC/EAN	2D, (Extra) Long Range
103	0: Disable RSS Expanded 1: Enable RSS Expanded	2D, (Extra) Long Range
104	0: Disable RSS Limited 1: Enable RSS Limited	2D, (Extra) Long Range
105	0: Disable RSS-14 1: Enable RSS-14	2D, (Extra) Long Range
106	0: Disable UPC-A (depends) 1: Enable UPC-A*	2D, (Extra) Long Range
108	0: Disable UPC-E1 (depends) 1: Enable UPC-E1*	2D, (Extra) Long Range

11 or 12 or 14 or 15 or 17 or 18 or 107 or 109	0: Disable Only Addon 2 & 5 of UPC & EAN Families (It requires "ALL" of the indexes to be set 0.) 1: Enable Only Addon 2 & 5 of UPC & EAN Families* (It requires "ANY" of the indexes to be set 1.)	2D, (Extra) Long Range
110	0: UPC Never Linked 1: UPC Always Linked* 2: Autodiscriminate UPC Composite	2D
111	0: Disable Composite CC-A/B 1: Enable Composite CC-A/B	2D
112	0: Disable Composite CC-C 1: Enable Composite CC-C	2D
113	0: Code 93 Length Limitation in Fixed Length Format 1: Code 93 Length Limitation in Max/Min Length Format	2D, (Extra) Long Range
114	Code 93 Max Code Length / Fixed Length1	2D, (Extra) Long Range
115	Code 93 Min Code Length / Fixed Length2 *(Length1 must be greater than Length2)	2D, (Extra) Long Range
116	0: Code 11 Length Limitation in Fixed Length Format 1: Code 11 Length Limitation in Max/Min Length Format	2D
117	Code 11 Max Code Length / Fixed Length1	2D
118	Code 11 Min Code Length / Fixed Length2 *(Length1 must be greater than Length2)	2D
119	0: Discrete 25 Length Limitation in Fixed Length Format 1: Discrete 25 Length Limitation in Max/Min Length Format	2D, (Extra) Long Range
120	Discrete 25 Max Code Length / Fixed Length1	2D, (Extra) Long Range
121	Discrete 25 Min Code Length / Fixed Length2 *(Length1 must be greater than Length2)	2D, (Extra) Long Range
122	0: Codabar Length Limitation in Fixed Length Format 1: Codabar Length Limitation in Max/Min Length Format	2D, (Extra) Long Range
123	Codabar Max Code Length / Fixed Length1	2D, (Extra) Long Range
124	Codabar Min Code Length / Fixed Length2 *(Length1 must be greater than Length2)	2D, (Extra) Long Range
125	0: DO NOT transmit US Postal Check Digit 1: Transmit US Postal Check Digit	2D

126	0: Disable Maxicode 1: Enable Maxicode	2D
127	0: Disable Data Matrix 1: Enable Data Matrix	2D
128	0: Disable QR Code 1: Enable QR Code	2D
129	0: Disable US Planet 1: Enable US Planet	2D
130	0: Disable US Postnet 1: Enable US Postnet	2D
131	0: Disable MicroPDF417 1: Enable MicroPDF417	2D
132	0: Disable PDF417 1: Enable PDF417	2D
133	0: Disable MicroPDF417 Code 128 Emulation 1: Enable MicroPDF417 Code 128 Emulation	2D
134	0: Disable Japan Postal 1: Enable Japan Postal	2D
135	0: Disable Australian Postal 1: Enable Australian Postal	2D
136	0: Disable Dutch Postal 1: Enable Dutch Postal	2D
137	0: Disable UK Postal Check Digit 1: Enable UK Postal Check Digit	2D
138	0: Disable UK Postal 1: Enable UK Postal	2D
139	0: Disable Joint Configuration 1: Enable Joint Configuration of No Addon, Addon 2 & 5 for Any Member of UPC/EAN Families*	2D, (Extra) Long Range
140	0: DO NOT verify Interleaved 25 Check Digit 1: Verify Interleaved 25 USS Check Digit 2: Verify Interleaved 25 OPCC Check Digit	2D, (Extra) Long Range
141	0: Disable UPC-A System Number & Country Code 1: Enable UPC-A System Number & Country Code	2D, (Extra) Long Range
142	0: Disable UPC-E0 System Number & Country Code 1: Enable UPC-E0 System Number & Country Code	2D, (Extra) Long Range

143	0: Disable UPC-E1 System Number & Country Code 1: Enable UPC-E1 System Number & Country Code	2D, (Extra) Long Range
144	0: No conversion 1: Convert Interleaved 25 to EAN-13*	2D, (Extra) Long Range
145	Scanner time-out duration in seconds for Aiming mode 0: No time-out 1 ~ 255 (sec): Aiming time-out	(Extra) Long Range
146	Macro PDF Transmit / Decode Mode 0: Passthrough all symbols 1: Buffer all symbols / Transmit Macro PDF when complete 2: Transmit any symbol in set / No particular order	2D
147	0: Disable Macro PDF Escape Characters 1: Enable Macro PDF Escape Characters	2D
148	N/A	---

APPENDIX II

Symbology Parameters

The CipherLab data terminals support the decodability of a number of barcode symbologies.

The BASIC Compiler provides a menu-driven interface to configure the decodability of these barcode symbologies, as well as the scanner behavior. The "Barcode Setting" window lets user check the box in front of a barcode type to enable the decodability of this barcode symbology. For some of the supported barcode symbologies, user may click the "Configure" button to do more configurations, such as enable/disable the checksum verification.

This appendix describes associated symbology parameters.

Scan Engine, CCD or Laser

Codabar

No. (N1%)	Values and Description (N2%)	Scan Engine
7	0: Disable Codabar (NW7) 1: Enable Codabar (NW7)	CCD, Laser
37	Select Codabar Start/Stop Character 0: abcd/abcd 1: abcd/tn*e 2: ABCD/ABCD 3: ABCD/TN*E	CCD, Laser
38	0: DO NOT transmit Codabar Start/Stop Character 1: Transmit Codabar Start/Stop Character	CCD, Laser

Select Start/Stop Character

User can select no start/stop characters or one of the four different start/stop character pairs, i.e. abcd/abcd, abcd/tn*e, ABCD/ABCD, and ABCD/TN*E, to be included in the data being transmitted.

Transmit Start/Stop Character

This parameter specifies whether the start/stop characters are included in the data being transmitted.

Code 2 of 5 Family

Industrial 25

No. (N1%)	Values and Description (N2%)	Scan Engine
4	0: Disable Industrial 25 1: Enable Industrial 25	CCD, Laser
30	0: DO NOT verify Industrial 25 Check Digit 1: Verify Industrial 25 Check Digit	CCD, Laser
31	0: DO NOT transmit Industrial 25 Check Digit 1: Transmit Industrial 25 Check Digit	CCD, Laser

35	Select Industrial 25 Start/Stop Pattern 0: Use Industrial 25 Start/Stop Pattern 1: Use Interleaved 25 Start/Stop Pattern 2: Use Matrix 25 Start/Stop Pattern	CCD, Laser
58	0: Industrial 25 Code Length Limitation in Fixed Length Format 1: Industrial 25 Code Length Limitation in Max/Min Length Format	CCD, Laser
59	Industrial 25 Max Code Length / Fixed Length 1	CCD, Laser
60	Industrial 25 Min Code Length / Fixed Length 2	CCD, Laser

Verify Check Digit

If this parameter is enabled, the terminal will perform checksum verification when decoding barcodes. If the checksum is incorrect, the barcode will not be accepted.

Transmit Check Digit

If this parameter is enabled, the checksum character will be included in the data being transmitted.

Select Start/Stop Pattern

This parameter provides the readability of all 2 of 5 symbology variants. For example, flight tickets actually use an Industrial 2 of 5 barcode but with Interleaved 2 of 5 start/stop. In order to read this barcode, the start/stop selection parameter of Industrial 2 of 5 should be set to "Interleaved 25".

Length Qualification

Because of the weak structure of the 2 of 5 barcodes, it is possible to make a "short scan" error. To prevent the "short scan" error, user can define the "Length Qualification" settings to ensure that the correct barcode is read by qualifying the allowable code length. The barcode can be qualified by "Fixed Length" or "Max/Min Length".

- If "Fixed Length" is selected, up to 2 fixed lengths can be specified.
- If "Max/Min Length" is selected, the maximum length and the minimum length must be specified. The terminal will only accept those barcodes with lengths that fall between max/min lengths specified.

Interleaved 25

Refer to Industrial 25.

No. (N1%)	Values and Description (N2%)	Scan Engine
5	0: Disable Interleaved 25 1: Enable Interleaved 25	CCD, Laser
28	0: DO NOT verify Interleaved 25 Check Digit 1: Verify Interleaved 25 Check Digit	CCD, Laser

29	0: DO NOT transmit Interleaved 2 Check Digit 1: Transmit Interleaved 25 Check Digit	CCD, Laser
34	Select Interleaved 25 Start/Stop Pattern 0: Use Industrial 25 Start/Stop Pattern 1: Use Interleaved 25 Start/Stop Pattern 2: Use Matrix 25 Start/Stop Pattern	CCD, Laser
61	0: Interleaved 25 Code Length Limitation in Fixed Length Format 1: Interleaved 25 Code Length Limitation in Max/Min Length Format	CCD, Laser
62	Interleaved 25 Max Code Length / Fixed Length 1	CCD, Laser
63	Interleaved 25 Min Code Length / Fixed Length 2	CCD, Laser

Matrix 25

Refer to Industrial 25.

No. (N1%)	Values and Description (N2%)	Scan Engine
6	0: Disable Matrix 25 1: Enable Matrix 25	CCD, Laser
32	0: DO NOT verify Matrix 25 Check Digit 1: Verify Matrix 25 Check Digit	CCD, Laser
33	0: DO NOT transmit Matrix 25 Check Digit 1: Transmit Matrix 25 Check Digit	CCD, Laser
36	Select Matrix 25 Start/Stop Pattern 0: Use Industrial 25 Start/Stop Pattern 1: Use Interleaved 25 Start/Stop Pattern 2: Use Matrix 25 Start/Stop Pattern	CCD, Laser
64	0: Matrix 25 Code Length Limitation in Fixed Length Format 1: Matrix 25 Code Length Limitation in Max/Min Length Format	CCD, Laser
65	Matrix 25 Max Code Length / Fixed Length 1	CCD, Laser
66	Matrix 25 Min Code Length / Fixed Length 2	CCD, Laser

Code 39

No. (N1%)	Values and Description (N2%)	Scan Engine
1	0: Disable Code 39 1: Enable Code 39	CCD, Laser
22	0: DO NOT transmit Code 39 Start/Stop Character 1: Transmit Code 39 Start/Stop Character	CCD, Laser
23	0: DO NOT verify Code 39 Check Digit 1: Verify Code 39 Check Digit	CCD, Laser
24	0: DO NOT transmit Code 39 Check Digit 1: Transmit Code 39 Check Digit	CCD, Laser
25	0: Standard Code 39 1: Full ASCII Code 39	CCD, Laser

Transmit Start/Stop Character

This parameter specifies whether the start/stop characters are included in the data being transmitted.

Verify Check Digit

If this parameter is enabled, the terminal will perform checksum verification when decoding barcodes. If the checksum is incorrect, the barcode will not be accepted.

Transmit Check Digit

If this parameter is enabled, the checksum character will be included in the data being transmitted.

Full ASCII Code 39

If this parameter is enabled, the terminal will support Code 39 Full ASCII that includes all the alphanumeric and special characters.

Code 93

No. (N1%)	Values and Description (N2%)	Scan Engine
8	0: Disable Code 93 1: Enable Code 93	CCD, Laser

Code 128/EAN-128

No. (N1%)	Values and Description (N2%)	Scan Engine
9	0: Disable Code 128 / EAN-128 1: Enable Code 128 / EAN-128	CCD, Laser

Italian/French Pharmacode

No. (N1%)	Values and Description (N2%)	Scan Engine
2	0: Disable Italian Pharmacode 1: Enable Italian Pharmacode	CCD, Laser
3	0: Disable CIP 39 (= French Pharmacode) 1: Enable CIP 39	CCD, Laser
26	0: DO NOT transmit Italian Pharmacode Check Digit 1: Transmit Italian Pharmacode Check Digit	CCD, Laser
27	0: DO NOT transmit CIP 39 Check Digit 1: Transmit CIP 39 Check Digit	CCD, Laser

Transmit Check Digit

If this parameter is enabled, the checksum character will be included in the data being transmitted.

Note: Share the Transmit Start/Stop Character setting with Code 39.

MSI

No. (N1%)	Values and Description (N2%)	Scan Engine
19	0: Disable MSI 1: Enable MSI	CCD, Laser
39	MSI Check Digit Verification 0: Single Modulo 10 1: Double Modulo 10 2: Modulo 11 and Modulo 10	CCD, Laser

40	MSI Check Digit Transmission 0: Last Check Digit is NOT transmitted 1: Both Check Digits are transmitted 2: Both Check Digits are NOT transmitted	CCD, Laser
67	0: MSI 25 Code Length Limitation in Fixed Length Format 1: MSI 25 Code Length Limitation in Max/Min Length Format	CCD, Laser
68	MSI Max Code Length / Fixed Length 1	CCD, Laser
69	MSI Min Code Length / Fixed Length 2	CCD, Laser

Verify Check Digit

User can select one of the three kinds of checksum calculations, i.e., Single Modulo 10, Double Modulo 10, and Modulo 11 & 10, to verify the MSI barcodes. If the checksum character is incorrect, the barcode will not be accepted.

Transmit Check Digit

This parameter specifies how the checksum is to be transmitted. User can select from “Last digit not transmitted”, “Transmitted”, and “Last 2 digits not transmitted”.

Length Qualification

Because of the weak structure of the MSI barcodes, it is possible to make a "short scan" error. To prevent the "short scan" error, user can define the "Length Qualification" settings to insure that the correct barcode is read by qualifying the allowable code length. The barcode can be qualified by "Fixed Length" or "Max/Min Length".

- If "Fixed Length" is selected, up to 2 fixed lengths can be specified.
- If "Max/Min Length" is selected, the maximum length and the minimum length must be specified. The terminal will only accept MSI barcodes with lengths that fall between max/min lengths specified.

Negative Barcode

No. (N1%)	Values and Description (N2%)	Scan Engine
55	0: Disable Negative Barcode 1: Enable Negative Barcode	CCD, Laser

Plessey

No. (N1%)	Values and Description (N2%)	Scan Engine
20	0: Disable Plessey 1: Enable Plessey	CCD, Laser
41	0: DO NOT transmit Plessey Check Digits 1: Transmit Plessey Check Digits	CCD, Laser
42	0: No conversion 1: Convert Standard Plessey to UK Plessey	CCD, Laser

Transmit Check Digits

If this parameter is enabled, the checksum characters (two characters) will be transmitted together with data.

Convert to UK Plessey

If this parameter is enabled, the terminal will change each occurrence of the character 'A' to character 'X' in the code.

RSS Family

No. (N1%)	Values and Description (N2%)	Scan Engine
74	0: Disable RSS Limited 1: Enable RSS Limited	CCD, Laser
75	0: Disable RSS Expanded 1: Enable RSS Expanded	CCD, Laser
76	0: Disable RSS-14 1: Enable RSS-14	CCD, Laser
77	0: DO NOT transmit RSS-14 Code ID 1: Transmit RSS-14 Code ID	CCD, Laser
78	0: DO NOT transmit RSS-14 Application ID 1: Transmit RSS-14 Application ID	CCD, Laser
79	0: DO NOT transmit RSS-14 Check Digit 1: Transmit RSS-14 Check Digit	CCD, Laser
80	0: DO NOT transmit RSS Limited Code ID 1: Transmit RSS Limited Code ID	CCD, Laser

81	0: DO NOT transmit RSS Limited Application ID 1: Transmit RSS Limited Application ID	CCD, Laser
82	0: DO NOT transmit RSS Limited Check Digit 1: Transmit RSS Limited Check Digit	CCD, Laser
83	0: DO NOT transmit RSS Expanded Code ID 1: Transmit RSS Expanded Code ID	CCD, Laser

Transmit Code ID

If this parameter is enabled, the default Code ID (“]e0”) will be included in the data being transmitted.

Transmit Application ID

If this parameter is enabled, the Application ID will be included in the data being transmitted.

Transmit Check Digit

If this parameter is enabled, the check digit will be included in the data being transmitted.

Telepen

No. (N1%)	Values and Description (N2%)	Scan Engine
84	0: Disable original Telepen 1: Enable original Telepen (Numeric)	CCD, Laser
85	0: Disable Telepen 1: Enable Telepen	CCD, Laser

Original Telepen (Numeric)

If this parameter is enabled, the terminal will support Telepen in numeric numbers only.

If this parameter is disabled, the terminal will support Telepen in full ASCII code. AIM Telepen (Full ASCII) includes all the alphanumeric and special characters.

UPC/EAN Families

EAN-8

No. (N1%)	Values and Description (N2%)	Scan Engine
13	0: Disable EAN-8 1: Enable EAN-8	CCD, Laser
14	0: Disable EAN-8 Addon 2 1: Enable EAN-8 Addon 2	CCD, Laser
15	0: Disable EAN-8 Addon 5 1: Enable EAN-8 Addon 5	CCD, Laser
49	0: DO NOT transmit EAN-8 Check Digit 1: Transmit EAN-8 Check Digit	CCD, Laser
53	0: No conversion 1: Convert EAN-8 to EAN-13	CCD, Laser

Transmit Check Digit

If this parameter is enabled, the checksum character will be included in the data being transmitted.

Convert EAN-8 to EAN-13

If this parameter is enabled, the read EAN-8 barcode will be expanded into EAN-13, and the next processing will follow the parameters configured for EAN-13.

EAN-13

No. (N1%)	Values and Description (N2%)	Scan Engine
16	0: Disable EAN-13/UPC-A 1: Enable EAN-13/UPC-A	CCD, Laser
17	0: Disable EAN-13/UPC-A Addon 2 1: Enable EAN-13/UPC-A Addon 2	CCD, Laser
18	0: Disable EAN-13/UPC-A Addon 5 1: Enable EAN-13/UPC-A Addon 5	CCD, Laser
45	0: No conversion 1: Enable ISBN Conversion	CCD, Laser
46	0: No conversion 1: Enable ISSN Conversion	CCD, Laser

50	0: DO NOT transmit EAN-13 Check Digit 1: Transmit EAN-13 Check Digit	CCD, Laser

Convert EAN-13 to ISBN

If this parameter is enabled, the read EAN-13 barcode starting with 978 or 979 will be converted to ISBN.

Convert EAN-13 to ISSN

If this parameter is enabled, the read EAN-13 barcode starting with 977 will be converted to ISSN.

Transmit Check Digit

If this parameter is enabled, the checksum character will be included in the data being transmitted.

GTIN

No. (N1%)	Values and Description (N2%)	Scan Engine
87	0: Disable GTIN 1: Enable GTIN	CCD, Laser

UPC-A

No. (N1%)	Values and Description (N2%)	Scan Engine
44	0: No conversion 1: Convert UPC-A to EAN-13	CCD, Laser
48	0: DO NOT transmit UPC-A Check Digit 1: Transmit UPC-A Check Digit	CCD, Laser
52	0: DO NOT transmit UPC-A System Number 1: Transmit UPC-A System Number	CCD, Laser

Convert UPC-A to EAN-13

If this parameter is enabled, the read UPC-A barcode will be expanded into EAN-13, and the next processing will follow the parameters configured for EAN-13.

Transmit Check Digit

If this parameter is enabled, the checksum character will be included in the data being transmitted.

Transmit System Number

If this parameter is enabled, the system number will be included in the data being transmitted.

UPC-E

No. (N1%)	Values and Description (N2%)	Scan Engine
10	0: Disable UPC-E 1: Enable UPC-E	CCD, Laser
11	0: Disable UPC-E Addon 2 1: Enable UPC-E Addon 2	CCD, Laser
12	0: Disable UPC-E Addon 5 1: Enable UPC-E Addon 5	CCD, Laser
43	0: No conversion 1: Convert UPC-E to UPC-A	CCD, Laser
47	0: DO NOT transmit UPC-E Check Digit 1: Transmit UPC-E Check Digit	CCD, Laser
51	0: DO NOT transmit UPC-E System Number 1: Transmit UPC-E System Number	CCD, Laser
86	0: Enable UPC-E0 1: Enable UPC-E1 / UPC-E0	CCD, Laser
148	0: Disable UPC-E1 Triple Check 1: Enable UPC-E1 Triple Check	CCD, Laser

Convert UPC-E to UPC-A

If this parameter is enabled, the read UPC-E barcode will be expanded into UPC-A, and the next processing will follow the parameters configured for UPC-A.

Transmit Check Digit

If this parameter is enabled, the checksum character will be included in the data being transmitted.

Transmit System Number

If this parameter is enabled, the system number will be included in the data being transmitted.

UPC-E1 Triple Check

If this parameter is enabled, the terminal will read the same UPC-E1 barcode three times to make a valid reading. This is helpful when the barcode is defaced and requires more attempts to read it successfully.

Scan Engine, 2D or (Extra) Long Range Laser

Codabar

No. (N1%)	Values and Description (N2%)	Scan Engine
7	0: Disable Codabar (NW7) 1: Enable Codabar (NW7)	2D, (Extra) Long Range
38	0: DO NOT transmit Codabar Start/Stop Character 1: Transmit Codabar Start/Stop Character	2D, (Extra) Long Range
122	0: Codabar Length Limitation in Fixed Length Format 1: Codabar Length Limitation in Max/Min Length Format	2D, (Extra) Long Range
123	Codabar Max Code Length / Fixed Length1	2D, (Extra) Long Range
124	Codabar Min Code Length / Fixed Length2 *(Length1 must be greater than Length2)	2D, (Extra) Long Range

Transmit Start/Stop Character

This parameter specifies whether the start/stop characters are included in the data being transmitted.

Length Qualification

The barcode can be qualified by “Fixed Length” or “Max/Min Length”. The length of a barcode refers to the number of characters (i.e. human readable characters), including check digit(s) it contains.

- If “Fixed Length” is selected, up to 2 fixed lengths can be specified.
- If “Max/Min Length” is selected, the maximum length and the minimum length must be specified. The terminal will only accept those barcodes with lengths that fall between max/min lengths specified.

Note: When it is configured to use Fixed Length format, Length1 must be greater than Length2. Otherwise, the format will be converted to Max/Min Length Format, and Length1 becomes Min. Length while Length2 becomes Max. Length. In either length format, when both of the values are configured to 0, it means no limit in length.

Code 2 of 5

Discrete 25

No. (N1%)	Values and Description (N2%)	Scan Engine
98	0: Disable Discrete 25 (= Industrial 25) 1: Enable Discrete 25	2D, (Extra) Long Range
119	0: Discrete 25 Length Limitation in Fixed Length Format 1: Discrete 25 Length Limitation in Max/Min Length Format	2D, (Extra) Long Range
120	Discrete 25 Max Code Length / Fixed Length1	2D, (Extra) Long Range
121	Discrete 25 Min Code Length / Fixed Length2 *(Length1 must be greater than Length2)	2D, (Extra) Long Range

Length Qualification

Because of the weak structure of the 2 of 5 barcodes, it is possible to make a "short scan" error. To prevent the "short scan" error, user can define the "Length Qualification" settings to ensure that the correct barcode is read by qualifying the allowable code length. Refer to Codabar.

Interleaved 25

No. (N1%)	Values and Description (N2%)	Scan Engine
5	0: Disable Interleaved 25 1: Enable Interleaved 25	2D, (Extra) Long Range
29	0: DO NOT transmit Interleaved 25 Check Digit 1: Transmit Interleaved 25 Check Digit	2D, (Extra) Long Range
61	0: Interleaved 25 Code Length Limitation in Fixed Length Format 1: Interleaved 25 Code Length Limitation in Max/Min Length Format	2D, (Extra) Long Range
62	Interleaved 25 Max Code Length / Fixed Length 1	2D, (Extra) Long Range
63	Interleaved 25 Min Code Length / Fixed Length 2 *(Length1 must be greater than Length2)	2D, (Extra) Long Range
140	0: DO NOT verify Interleaved 25 Check Digit 1: Verify Interleaved 25 USS Check Digit 2: Verify Interleaved 25 OPCC Check Digit	2D, (Extra) Long Range

144	0: No conversion 1: Convert Interleaved 25 to EAN-13*	2D, (Extra) Long Range

Transmit Check Digit

If this parameter is enabled, the checksum character will be included in the data being transmitted.

Length Qualification

Because of the weak structure of the 2 of 5 barcodes, it is possible to make a "short scan" error. To prevent the "short scan" error, user can define the "Length Qualification" settings to insure that the correct barcode is read by qualifying the allowable code length. Refer to Codabar.

Verify Check Digit

If this parameter is enabled, the terminal will perform checksum verification when decoding barcodes. If the checksum is incorrect, the barcode will not be accepted.

Convert to EAN-13

Interleaved 25 barcode must have a leading zero and a valid EAN-13 check digit.

Note: "Convert Interleaved 25 to EAN-13" cannot be enabled unless its checksum verification is disabled (=0).

Code 39

No. (N1%)	Values and Description (N2%)	Scan Engine
1	0: Disable Code 39 1: Enable Code 39	2D, (Extra) Long Range
2	0: Disable Code 32 (= Italian Pharmacode) 1: Enable Code 32	2D, (Extra) Long Range
23	0: DO NOT verify Code 39 Check Digit 1: Verify Code 39 Check Digit	2D, (Extra) Long Range
24	0: DO NOT transmit Code 39 Check Digit 1: Transmit Code 39 Check Digit	2D, (Extra) Long Range
25	0: Standard Code 39 1: Full ASCII Code 39	2D, (Extra) Long Range
88	0: Code 39 Length Limitation in Fixed Length Format 1: Code 39 Length Limitation in Max/Min Length Format	2D, (Extra) Long Range
89	Code 39 Max Code Length / Fixed Length1	2D, (Extra) Long Range

90	Code 39 Min Code Length / Fixed Length2 *(Length1 must be greater than Length2)	2D, (Extra) Long Range
100	0: Disable Trioptic Code 39 1: Enable Trioptic Code 39*	2D, (Extra) Long Range

Verify Check Digit

If this parameter is enabled, the terminal will perform checksum verification when decoding barcodes. If the checksum is incorrect, the barcode will not be accepted.

Transmit Check Digit

If this parameter is enabled, the checksum character will be included in the data being transmitted.

Note: "Verify Check Digit" must be enabled so that the check digit can be left out when it is preferred not to transmit the check digit.

Full ASCII Code 39

If this parameter is enabled, the terminal will support Code 39 Full ASCII that includes all the alphanumeric and special characters.

Length Qualification

Refer to Codabar.

Code 93

No. (N1%)	Values and Description (N2%)	Scan Engine
8	0: Disable Code 93 1: Enable Code 93	2D, (Extra) Long Range
113	0: Code 93 Length Limitation in Fixed Length Format 1: Code 93 Length Limitation in Max/Min Length Format	2D, (Extra) Long Range
114	Code 93 Max Code Length / Fixed Length1	2D, (Extra) Long Range
115	Code 93 Min Code Length / Fixed Length2 *(Length1 must be greater than Length2)	2D, (Extra) Long Range

Length Qualification

Refer to Codabar.

Code 128

No. (N1%)	Values and Description (N2%)	Scan Engine
9	0: Disable Code 128 1: Enable Code 128	2D, (Extra) Long Range

ISBT 128

ISBT 128 is a variant of Code 128 used in the blood bank industry.

No. (N1%)	Values and Description (N2%)	Scan Engine
99	0: Disable ISBT 128 1: Enable ISBT 128	2D, (Extra) Long Range

UCC/EAN-128

No. (N1%)	Values and Description (N2%)	Scan Engine
101	0: Disable UCC/EAN-128 1: Enable UCC/EAN-128	2D, (Extra) Long Range

MSI

No. (N1%)	Values and Description (N2%)	Scan Engine
19	0: Disable MSI 1: Enable MSI	2D, (Extra) Long Range
39	MSI Check Digit Verification 0: Single Modulo 10 1: Double Modulo 10 2: Modulo 11 and Modulo 10	2D, (Extra) Long Range

40	MSI Check Digit Transmission 0: Last Check Digit is NOT transmitted 1: Both Check Digits are transmitted 2: Both Check Digits are NOT transmitted	2D, (Extra) Long Range
67	0: MSI 25 Code Length Limitation in Fixed Length Format 1: MSI 25 Code Length Limitation in Max/Min Length Format	2D, (Extra) Long Range
68	MSI Max Code Length / Fixed Length 1	2D, (Extra) Long Range
69	MSI Min Code Length / Fixed Length 2 *(Length1 must be greater than Length2)	2D, (Extra) Long Range

Verify Check Digit

User can select one of the three kinds of checksum calculations, i.e., Single Modulo 10, Double Modulo 10, and Modulo 11 & 10, to verify the MSI barcodes. If the checksum character(s) is incorrect, the barcode will not be accepted.

Transmit Check Digit

This parameter specifies how the checksum is to be transmitted. User can select from “Last digit not transmitted”, “Transmitted”, and “Last 2 digits not transmitted”.

Length Qualification

Because of the weak structure of the MSI barcodes, it is possible to make a "short scan" error. To prevent the "short scan" error, user can define the "Length Qualification" settings to ensure that the correct barcode is read by qualifying the allowable code length. Refer to Codabar.

RSS Family

No. (N1%)	Values and Description (N2%)	Scan Engine
102	0: No conversion 1: Convert RSS to UPC/EAN	2D, (Extra) Long Range
103	0: Disable RSS Expanded 1: Enable RSS Expanded	2D, (Extra) Long Range
104	0: Disable RSS Limited 1: Enable RSS Limited	2D, (Extra) Long Range
105	0: Disable RSS-14 1: Enable RSS-14	2D, (Extra) Long Range

Convert RSS to UPC/EAN

If this parameter is enabled, the RSS barcodes will be converted to UPC/EAN. This only applies to RSS-14 and RSS Limited barcodes not decoded as part of a Composite barcode.

(1) When enabled, the leading “010” will be stripped from these barcodes and a “0” will be encoded as the first digit; this will convert RSS barcodes to EAN-13.

(2) For barcodes beginning with two or more zeros but not six zeros, this option will strip the leading “0010” and report the barcode as UPC-A. The UPC-A Preamble setting that transmits the system character and country code applies to such converted barcodes. Note that neither the system character nor the check digit can be stripped.

UPC/EAN Families

The UPC/EAN families include No Addon, Addon 2, and Addon 5 for the following symbologies:

- UPC-E0
- UPC-E1
- UPC-A
- EAN-8
- EAN-13
- Bookland EAN (for ISBN)

For any member belonging to the UPC/EAN families, Index No. 139 is used to decide the joint configuration of No Addon, Addon 2, and Addon 5. Other parameters are listed below.

No. (N1%)	Values and Description (N2%)	Scan Engine
43	0: No conversion 1: Convert UPC-E0 to UPC-A	2D, (Extra) Long Range
47	0: DO NOT transmit UPC-E0 Check Digit 1: Transmit UPC-E0 Check Digit	2D, (Extra) Long Range
48	0: DO NOT transmit UPC-A Check Digit 1: Transmit UPC-A Check Digit	2D, (Extra) Long Range
51	0: DO NOT transmit UPC-E0 System Number 1: Transmit UPC-E0 System Number	2D, (Extra) Long Range
52	0: DO NOT transmit UPC-A System Number 1: Transmit UPC-A System Number	2D, (Extra) Long Range

53	0: No conversion 1: Convert EAN-8 to EAN-13	2D, (Extra) Long Range
91	0: DO NOT transmit UPC-E1 System Number 1: Transmit UPC-E1 System Number	2D, (Extra) Long Range
92	0: DO NOT transmit UPC-E1 Check Digit 1: Transmit UPC-E1 Check Digit	2D, (Extra) Long Range
95	0: No conversion 1: Convert UPC-E1 to UPC-A	2D, (Extra) Long Range
141	0: Disable UPC-A System Number & Country Code 1: Enable UPC-A System Number & Country Code	2D, (Extra) Long Range
142	0: Disable UPC-E0 System Number & Country Code 1: Enable UPC-E0 System Number & Country Code	2D, (Extra) Long Range
143	0: Disable UPC-E1 System Number & Country Code 1: Enable UPC-E1 System Number & Country Code	2D, (Extra) Long Range

Convert UPC-E0/UPC-E1 to UPC-A

If this parameter is enabled, the read UPC-E0/UPC-E1 barcode will be expanded into UPC-A, and the next processing will follow the parameters configured for UPC-A.

Convert EAN-8 to EAN-13

If this parameter is enabled, the read EAN-8 barcode will be expanded into EAN-13, and the next processing will follow the parameters configured for EAN-13.

Transmit Check Digit

If this parameter is enabled, the checksum character will be included in the data being transmitted.

Transmit System Number

If this parameter is enabled, the system number will be included in the data being transmitted.

Joint Configuration

No. (N1%)	Values and Description (N2%)	Scan Engine
139	0: Disable Joint Configuration 1: Enable Joint Configuration of No Addon, Addon 2 & 5 for Any Member of UPC/EAN Families	2D, (Extra) Long Range

- If Index No. 139 for joint configuration is set 1, the parameters of Table I can be configured separately. It depends on which member of the families needs to be enabled.
- If Index No. 139 for Joint Configuration is set 0, then

  - When "ANY" of the indexes of Table II is set 1, only Addon 2 & 5 of the whole UPC/EAN families are enabled. (= Disable No Addon)

  - When "ALL" of the indexes of Table II are set 0, only No Addon is enabled that is further decided by Table I.

When			**Results in**	
Index No. 139	Index No. listed in Table I	Index No. listed in Table II	No Addon	Addon 2 & 5
= 1	= 1	N/A	Enabled	Enabled
= 1	= 0	N/A	Disabled	Disabled
= 0	N/A	Any = 1	Disabled*(All)	Enabled *(All)
= 0	= 1	All = 0	Enabled	Disabled*(All)
= 0	= 0	= 0	Disabled	Disabled*(All)

Note: The result marked with "All" indicates it occurs with the whole UPC/EAN families.

Table I

No. (N1%)	Values and Description (N2%)	Scan Engine
10	0: Disable UPC-E0 (depends) 1: Enable UPC-E0*	2D, (Extra) Long Range
13	0: Disable EAN-8 (depends) 1: Enable EAN-8*	2D, (Extra) Long Range
16	0: Disable EAN-13 (depends) 1: Enable EAN-13*	2D, (Extra) Long Range
97	0: Disable Bookland EAN 1: Enable Bookland EAN* (Index No. 16 for EAN-13 is required to be 1.)	2D, (Extra) Long Range
106	0: Disable UPC-A (depends) 1: Enable UPC-A*	2D, (Extra) Long Range
108	0: Disable UPC-E1 (depends) 1: Enable UPC-E1*	2D, (Extra) Long Range

Note: (1) Index No. 139 = 1: No Addon, Addon 2, Addon 5 of the symbology are enabled.
(2) Index No. 139 = 0 (and all the indexes in Table II below must be set 0): Only No Addon of the symbology is enabled.

Table II

No. (N1%)	Values and Description (N2%)	Scan Engine
11 or 12 or 14 or 15 or 17 or 18 or 107 or 109	0: Disable Only Addon 2 & 5 of UPC & EAN Families (It requires "ALL" of the indexes to be set 0.) 1: Enable Only Addon 2 & 5 of UPC & EAN Families* (It requires "ANY" of the indexes to be set 1.)	2D, (Extra) Long Range

2D Scan Engine Only

In addition to those symbologies described previously, the 2D scan engine supports the following symbologies:

1D Symbologies

Code 11

No. (N1%)	Values and Description (N2%)	Scan Engine
96	0: Disable Code 11 1: Enable Code 11	2D
116	0: Code 11 Length Limitation in Fixed Length Format 1: Code 11 Length Limitation in Max/Min Length Format	2D
117	Code 11 Max Code Length / Fixed Length1	2D
118	Code 11 Min Code Length / Fixed Length2 *(Length1 must be greater than Length2)	2D

Length Qualification

The barcode can be qualified by "Fixed Length" or "Max/Min Length". The length of a barcode refers to the number of characters (i.e. human readable characters), including check digit(s) it contains.

- If "Fixed Length" is selected, up to 2 fixed lengths can be specified.
- If "Max/Min Length" is selected, the maximum length and the minimum length must be specified. The terminal will only accept those barcodes with lengths that fall between max/min lengths specified.

Note: When it is configured to use Fixed Length format, Length1 must be greater than Length2. Otherwise, the format will be converted to Max/Min Length Format, and Length1 becomes Min. Length while Length2 becomes Max. Length. In either length format, when both of the values are configured to 0, it means no limit in length.

Postal Code Family

No. (N1%)	Values and Description (N2%)	Scan Engine
125	0: DO NOT transmit US Postal Check Digit 1: Transmit US Postal Check Digit	2D
129	0: Disable US Planet 1: Enable US Planet	2D
130	0: Disable US Postnet 1: Enable US Postnet	2D
134	0: Disable Japan Postal 1: Enable Japan Postal	2D
135	0: Disable Australian Postal 1: Enable Australian Postal	2D
136	0: Disable Dutch Postal 1: Enable Dutch Postal	2D
137	0: Disable UK Postal Check Digit 1: Enable UK Postal Check Digit	2D
138	0: Disable UK Postal 1: Enable UK Postal	2D

Transmit Check Digit

If this parameter is enabled, the check digit will be included in the data being transmitted.

Composite Codes

CC-A/B/C

No. (N1%)	Values and Description (N2%)	Scan Engine
111	0: Disable Composite CC-A/B 1: Enable Composite CC-A/B	2D
112	0: Disable Composite CC-C 1: Enable Composite CC-C	2D

TLC-39

No. (N1%)	Values and Description (N2%)	Scan Engine
94	0: Disable TCIF Linked Code 39 1: Enable TCIF Linked Code 39	2D

UPC Composite

No. (N1%)	Values and Description (N2%)	Scan Engine
110	0: UPC Never Linked 1: UPC Always Linked* 2: Autodiscriminate UPC Composite	2D

Select UPC Composite Mode

UPC barcode can be "linked" with a 2D barcode during transmission as if they were one barcode. There are three options for these barcodes:

- UPC Never Linked - To transmit UPC barcodes regardless of whether a 2D barcode is detected.
- UPC Always Linked - To transmit UPC barcodes and the 2D portion.
- Autodiscriminate UPC Composite - To transmit UPC barcodes, as well as the 2D portion if present.

Note: If "UPC Always Linked" is enabled, either CC-A/B or CC-C must be enabled. Otherwise, it will not transmit even there are UPC barcodes.

UCC/EAN Composite Code

No. (N1%)	Values and Description (N2%)	Scan Engine
93	0 : Disable UCC/EAN Code 128 Emulation Mode for UCC/EAN Composite Code 1 : Enable UCC/EAN Code 128 Emulation Mode for UCC/EAN Composite Code	2D

2D Symbologies

Data Matrix

No. (N1%)	Values and Description (N2%)	Scan Engine
127	0: Disable Data Matrix 1: Enable Data Matrix	2D

Maxicode

No. (N1%)	Values and Description (N2%)	Scan Engine
126	0: Disable Maxicode 1: Enable Maxicode	2D

PDF417

No. (N1%)	Values and Description (N2%)	Scan Engine
131	0: Disable MicroPDF417 1: Enable MicroPDF417	2D
132	0: Disable PDF417 1: Enable PDF417	2D
133	0: Disable MicroPDF417 Code 128 Emulation 1: Enable MicroPDF417 Code 128 Emulation (Index No. 131 for MicroPDF417 is required to be 1.)	2D
146	Macro PDF Transmit / Decode Mode 0: Passthrough all symbols 1: Buffer all symbols / Transmit Macro PDF when complete 2: Transmit any symbol in set / No particular order	2D
147	0 : Disable Macro PDF Escape Characters 1 : Enable Macro PDF Escape Characters	2D

MicroPDF417 Code 128 Emulation

If Code 128 Emulation is enabled, these MicroPDF417 barcodes are transmitted with one of the following prefixes:

-]C1 if the first codeword is 903-907, 912, 914, 915
-]C2 if the first codeword is 908 or 909
-]C0 if the first codeword is 910 or 911

If disabled, they are transmitted with one of the following prefixes:

-]L3 if the first codeword is 903-907, 912, 914, 915
-]L4 if the first codeword is 908 or 909
-]L5 if the first codeword is 910 or 911

Macro PDF Transmit / Decode Mode

Macro PDF is a special feature for concatenating multiple PDF symbols into one file, known as Macro PDF417 or Macro MicroPDF417.

There are three options for handling Macro PDF decoding:

- Passthrough all symbols – to transmit and decode all Macro PDF symbols and perform no processing. In this mode, the host is responsible for detecting and parsing the Macro PDF sequences.
- Buffer all symbols / Transmit Macro PDF when complete – to transmit all decoded data from an entire Macro PDF sequence only when the entire sequence is scanned and decoded. If the decoded data exceeds the limit of 50 symbols, no transmission because the entire sequence was not scanned!
- Transmit any symbol in set / No particular order – to transmit data from each Macro PDF symbol as decoded, regardless of the sequence. When selecting this mode, Transmit Control Header is enabled.

Macro PDF Escape Characters

When enabled, it uses the backlash "\" as an Escape character for systems that can process transmissions containing special data sequences. It will format special data according to the Global Label Identifier (GLI) protocol, which only affects the data portion of a Macro PDF symbol transmission. The Control Header, if enabled, is always sent with GLI formatting.

QR Code

No. (N1%)	Values and Description (N2%)	Scan Engine
128	0: Disable QR Code 1: Enable QR Code	2D

APPENDIX III

Scanner Parameters

This appendix describes associated scanner parameters.

Scan Mode

Index 70 is used to define a scan mode that best suits the requirements of a specific application.

Index 72 or 145 is used to define a scanner timeout, if necessary.

- 9 scan modes are supported on CCD or Laser scan engine. See the comparison table below.
- Only Laser and Aiming modes are supported on (Extra) Long Range Laser scan engine.

  When in aiming mode, it will generate an aiming dot once you press the trigger key. The aiming dot will not go off until it times out or you press the trigger key again to start scanning.

No. (N1%)	Values and Description (N2%)	Scan Engine
70	Scan Mode for Scanner Port 1 0: Auto Off Mode 1: Continuous Mode 2: Auto Power Off Mode 3: Alternate Mode 4: Momentary Mode 5: Repeat Mode 6: Laser Mode 7: Test Mode 8: Aiming Mode	CCD, Laser
70	Scan Mode for Scanner Port 1 8: Aiming Mode Any value (0~15) other than 8: Laser Mode (= aiming beam disabled)	(Extra) Long Range

Comparison of Scan Modes

Scan Mode	ON				OFF			
	Always	*Press trigger once*	*Hold trigger*	*Press trigger twice*	*Release trigger*	*Press trigger once*	*Barcode being read*	*Timeout*
Continuous mode	✓							
Test mode	✓							
Repeat mode	✓							
Momentary mode			✓		✓			
Alternate mode		✓				✓		
Aiming mode				✓			✓	✓
Laser mode			✓		✓		✓	✓
Auto Off mode		✓					✓	✓
Auto Power Off mode		✓						✓

Continuous Mode

- The reader is always scanning, but only one decoding is allowed for the same barcode. That is, to read (i.e. scan and decode) the same barcode multiple times, the barcode has to be taken away and replaced for new scanning.
- Several modes have been developed based on this mode.

Test Mode

- The reader is always scanning for testing purpose.
- Comparing to the Continuous mode, it will decode repeatedly even with the same barcode without re-approaching.

Repeat Mode

This mode is most useful when the same barcode is to be read many times. When the scan trigger is pressed within one second after a successful reading, the same data will be re-transmitted without actually reading the barcode. Such re-transmission can be activated as many times as needed, as long as the time interval between each triggering does not exceed one second.

- The reader is always scanning.
- It will decode once for the same barcode and allow for re-transmission when triggering within one second.

Momentary Mode

- Hold down the scan trigger to start scanning.
- The scanning continues until the trigger is released.

Alternate Mode

- Press the scan trigger to start scanning.
- The scanning continues until the trigger is pressed again.

Aiming Mode

This mode best applies when two barcodes are printed too close to each other. It is necessary to take aim first to make sure the correct barcode will be scanned.

- Press the scan trigger to aim at a barcode. Within one second, press the trigger again to decode the barcode.
- The scanning continues until one of the events happens:

  (1) A barcode is read.

  (2) The preset timeout expires.

Note: The system global variable AIMING_TIMEOUT can be used to change the default one-second timeout interval for aiming. The unit for this variable is 5 ms.

Laser Mode

This mode is most often used on laser scanners.

- Hold down the scan trigger to start scanning.
- The scanning continues until one of the events happens:

  (1) A barcode is read.

  (2) The preset timeout expires.

  (3) The trigger is released.

Auto Off Mode

This is the default mode.

- The reader will start to scan once the scan trigger is pressed.
- The scanning continues until one of the events happens:

  (1) A barcode is read.

  (2) The preset timeout expires.

Auto Power Off Mode

- The reader will start to scan once the scan trigger is pressed.
- The scanning continues until one of the events happens:

  (1) The preset timeout expires.
- Comparing to the Auto Off mode, the reader continues to scan whenever there is a successful reading of barcode because its timeout period re-counts.

Read Redundancy

This parameter is used to specify the level of reading security. User has to compromise between reading security and decoding speed.

No. (N1%)	Values and Description (N2%)	Scan Engine
56	0: No Read Redundancy for Scanner Port 1 1: One Time Read Redundancy for Scanner Port 1 2: Two Times Read Redundancy for Scanner Port 1 3: Three Times Read Redundancy for Scanner Port 1	CCD, Laser

- No Redundancy:

  If "No Redundancy" is selected, one successfully decoded barcode will make the reading valid and induce the "READER Event".

- One/Two/Three Times:

  If "Three Times" is selected, it will take a total of four consecutive successful decodings of the same barcode to make the reading valid.

  The higher the reading security is (that is, the more redundancy user selects), the slower the reading speed gets.

Time-Out

These parameters are used to limit the maximum scanning time interval for a specific scan mode. The time interval is specified in units of second, ranging from 0 to 255. It is set 10 seconds by default.

- CCD or Laser scan engine:

  - Aiming mode

  - Laser mode

  - Auto Off mode

  - Auto Power Off mode

- (Extra) Long Range Laser scan engine: Aiming mode only.

No. (N1%)	Values and Description (N2%)	Scan Engine
72	Scanner Time-out Duration in seconds for Scanner Port 1: applicable to Aiming mode, Laser mode, Auto Off mode, and Auto Power Off mode.	CCD, Laser
145	Scanner time-out duration in seconds for Aiming mode 0: No time-out 1 ~ 255 (sec): Aiming time-out	(Extra) Long Range

APPENDIX IV

Run-Time Error Table

Error Code	Explanation
1	Unknown operator
2	Operand count mismatch
3	Type mismatch
4	Can't perform type conversion
5	No available temp string
6	Illegal operand
7	Not an L-value
8	Float error
9	Bad array subscript
10	Unknown function
11	Illegal function call
12	Return without GOSUB

APPENDIX V

Debugging Messages

Debugging messages indicate the activities happening on the system. The common debugging messages are listed as follows.

Message	Explanation
ABS(N)	Indicating the command ABS is processed.
ADD(N1%,N2%)	Indicating an addition is processed.
ADD_RECORD(file%,data$)	Indicating the command ADD_RECORD is processed.
ALPHA_LOCK(status%)	Indicating the command ALPHA_LOCK is processed.
AND	Indicating the logical operation AND is processed.
ARY(N%)	Indicating an N-element array is declared.
ASC(X$)	Indicating the command ASC is processed.
ASGN(A)	Indicating that the value A is assigned to the variable. A could be an integer, long integer, character, string, or any type.
AUTO_OFF(N%)	Indicating the command AUTO_OFF is processed. N% is the assigned time interval.
BACK_LIGHT_DURATION(N%)	Indicating the command BACK_LIGHT_DURATION is processed. N% is the assigned time interval.
BACKLIT(state%)	Indicating the command BACKLIT is processed.
BACKUP_BATTERY	Indicating the command BACKUP_BATTERY is processed.
BEEP(...)	Indicating the command BEEP is processed.
BIT_OPERATOR(…)	Indicating the command BIT_OPERATOR is processed.
BT_INQUIRY$	Indicating the command BT_INQUIRY$ is processed.
BT_PAIRING(addr$,type%)	Indicating the command BT_PAIRING is processed.
CHANGE_SPEED(N%)	Indicating the command CHANGE_SPEED is processed. N% is the selection of the speed.
CHECK_RF_BASE	Indicating the command CHECK_RF_BASE is processed.
CHECK_RF_SEND	Indicating the command CHECK_RF_SEND is processed.
CHR$(N%)	Indicating the command CHR is processed.
CIRCLE(...)	Indicating the command CIRCLE is processed.
CLOSE_COM(N%)	Indicating the command CLOSE_COM is processed. N% is the number of the COM port.
CLR_KBD	Indicating the command CLR_KBD is processed.

CLR_RECT(...)	Indicating the command CLR_RECT is processed.
CLS	Indicating the command CLS is processed.
CODE_TYPE	Indicating the command CODE_TYPE is processed.
COM_DELIMITER(N%,C%)	Indicating the command COM_DELIMITER is processed.
CURSORX	Indicating the command CURSOR_X is processed.
CURSORY	Indicating the command CURSOR_Y is processed.
DATE$	Indicating the system date is inquired.
DATE$(X$)	Indicating the system date is updated. X$ is the new system date.
DAY_OF_WEEK	Indicating the command DAY_OF_WEEK is processed.
DEL_RECORD(file%[,index%])	Indicating the command DEL_RECORD is processed.
DEL_TRANSACTION_DATA(N%)	Indicating the command DEL_TRANSACTION_DATA is processed. N% is the number of records to be deleted.
DEL_TRANSACTION_DATA_EX(file%,N%)	Indicating the command DEL_TRANSACTION_DATA_EX is processed.
DISABLE_READER(N%)	Indicating the command DISABLE READER is processed. N% is the number of the reader port.
DISABLE_TOUCHSCREEN	Indicating the command DISABLE_TOUCHSCREEN is processed.
DIV(N1%,N2%)	Indicating a division is processed.
DNS_RESOLVER(A$)	Indicating the command DNS_RESOLVER is processed.
EMPTY_FILE(file%)	Indicating the command EMPTY_FILE is processed. file% is the number of the DBF file.
EMPTY_TRANSACTION	Indicating the command EMPTY_TRANSACTION is processed.
EMPTY_TRANSACTION_EX(file%)	Indicating the command EMPTY_TRANSACTION_EX is processed. file% is the number of the transaction file.
ENABLE_READER(N%)	Indicating the command ENABLE READER is processed. N% is the number of the reader port.
ENABLE_TOUCHSCREEN	Indicating the command ENABLE TOUCHSCREEN is processed.
EQU? (N1%,N2%)	Indicating the decision "IF N1% = N2%" is processed.
EVENT(0)	Indicating the "COM(1) EVENT" happens.
EVENT(1)	Indicating the "COM(2) EVENT" happens.
EVENT(2)	Indicating the "COM(3) EVENT" happens.
EVENT(3)	Reserved.
EVENT(4)	Reserved.
EVENT(5)	Reserved.
EVENT(6)	Reserved.

EVENT(7)	Reserved.
EVENT(8)	Reserved.
EVENT(9)	Indicating the "TIMER(1) EVENT" happens.
EVENT(10)	Indicating the "TIMER(2) EVENT" happens.
EVENT(11)	Indicating the "TIMER(3) EVENT" happens.
EVENT(12)	Indicating the "TIMER(4) EVENT" happens.
EVENT(13)	Indicating the "TIMER(5) EVENT" happens.
EVENT(14)	Indicating the "ON MINUTE EVENT" happens.
EVENT(15)	Indicating the "ON HOUR EVENT" happens.
EVENT(16)	Indicating the "READER(1) EVENT" happens.
EVENT(17)	Indicating the "READER(2) EVENT" happens.
EVENT(18)	Indicating the "FUNCTION(1) EVENT" happens.
EVENT(19)	Indicating the "FUNCTION(2) EVENT" happens.
EVENT(20)	Indicating the "FUNCTION(3) EVENT" happens.
EVENT(21)	Indicating the "FUNCTION(4) EVENT" happens.
EVENT(22)	Indicating the "FUNCTION(5) EVENT" happens.
EVENT(23)	Indicating the "FUNCTION(6) EVENT" happens.
EVENT(24)	Indicating the "FUNCTION(7) EVENT" happens.
EVENT(25)	Indicating the "FUNCTION(8) EVENT" happens.
EVENT(26)	Indicating the "FUNCTION(9) EVENT" happens.
EVENT(27)	Indicating the "FUNCTION(10) EVENT" happens.
EVENT(28)	Indicating the "FUNCTION(11) EVENT" happens.
EVENT(29)	Indicating the "FUNCTION(12) EVENT" happens.
EVENT(30)	Reserved.
EVENT(31)	Indicating the "ESC EVENT" happens.
EXP(N1%,N2%)	Indicating an exponentiation is processed.
FALSE?(N%)	Indicating the "IF" statement or the "WHILE" statement is processed.
FILL_RECT(...)	Indicating the command FILL_RECT is processed.
FIND_RECORD(...)	Indicating the command FIND_RECORD is processed.
FLASH_READ$(N%)	Indicating the command FLASH_READ$ is processed.
FLASH_WRITE(N%,A$)	Indicating the command FLASH_WRITE is processed.
FREE_MEMORY	Indicating the command FREE_MEMORY is processed.
FUNCTION_TOGGLE(status%)	Indicating the command FUNCTION_TOGGLE is processed.

GE? (N1%,N2%)	Indicating the decision "IF N1% >= N2%" is processed.
GET_ALPHA_LOCK	Indicating the command GET_ALPHA_LOCK is processed.
GET_CTS(N%)	Indicating the command GET_CTS is processed. N% is the number of the COM port.
GET_DEVICE_ID	Indicating the command DEVICE_ID is processed.
GET_FILE_ERROR	Indicating the command GET_FILE_ERROR is processed.
GET_IMAGE	Indicating the command GET_IMAGE is processed.
GET_LANGUAGE	Indicating the command GET_LANGUAGE is processed.
GET_NET_PARAMETER$(index%)	Indicating the command GET_NET_PARAMETER$ is processed.
GET_NET_STATUS(index%)	Indicating the command GET_NET_STATUS is processed.
GET_READER_DATA$(N%)	Indicating the command GET_READER_DATA$ is processed. N% is the number of the reader port.
GET_READER_SETTING(N%)	Indicating the command GET_READER_SETTING is processed. N% is the setting number.
GET_RECORD$(file%[,index%])	Indicating the command GET_RECORD$ is processed.
GET_RECORD_NUMBER(file%[,index%])	Indicating the command GET_READER_NUMBER is processed.
GET_RF_CHANNEL	Indicating the command GET_RF_CHANNEL is processed.
GET_RF_ID	Indicating the command GET_RF_ID is processed.
GET_RF_POWER	Indicating the command GET_RF_POWER is processed.
GET_RFID_KEY(TagType%)	Indicating the command GET_RFID_KEY is processed.
GET_SCREENITEM	Indicating the command GET_SCREENITEM is processed.
GET_TARGET_MACHINE$	Indicating the command GET_TARGET_MACHINE$ is processed.
GET_TCPIP_MESSAGE	Indicating the command GET_TCPIP_MESSAGE is processed.
GET_TRANSACTION_DATA$(N%)	Indicating the command GET_TRANSACTION_DATA is processed. N% is the ordinal number of the record to be read.
GET_TRANSACTION_DATA_EX$(file%,N%)	Indicating the command GET_TRANSACTION_DATA_EX is processed.
GOSUB(N%)	Indicating the program branches to a subroutine. N% is the line number of the first line of the subroutine.
GOTO(N%)	Indicating the program branches to line number N%.
GSM_CHANGE_PIN(old$,new$)	Indicating the command GSM_CHANGE_PIN is processed.
GSM_CHECK_PIN(pin$)	Indicating the command GSM_CHECK_PIN is processed.
GSM_SET_PINLOCK(pin$,mode%)	Indicating the command GSM_SET_PINLOCK is processed.
GT? (N1%,N2%)	Indicating the decision "IF N1% > N2%" is processed.

HEX$(N%)	Indicating the command HEX$ is processed.
ICON_ZONE_PRINT(status%)	Indicating the command ICON_ZONE_PRINT is processed.
INKEY$(A$)	Indicating the command INKEY is processed.
INPUT	Indicating the command INOUT is processed.
INPUT_MODE(mode%)	Indicating the command INPUT_MODE is processed.
INSTR([N%,] X$,Y$)	Indicating the command INSTR is processed.
INT(N%)	Indicating the command INT is processed.
IRDA_STATUS(N%)	Indicating the command IRDA_STATUS is processed. N% is the connection or transmission status.
IRDA_TIMEOUT(N%)	Indicating the command IRDA_TIMEOUT is processed. N% is the assigned time interval.
KEY_CLICK(status%)	Indicating the command KEY_CLICK is processed.
L(N%)	Indicating the line number being executed.
LCASE$(X$)	Indicating the command LCASE$ is processed.
LCD_CONTRAST(N%)	Indicating the command LCD_CONTRAST is processed. N% is the contrast level in the range of 1 ~ 8.
LE? (N1%,N2%)	Indicating the decision "IF N1% <= N2%" is processed.
LED(...)	Indicating the command LED is processed.
LEFT$(X$,N%)	Indicating the command LEFT$ is processed.
LEN(X$)	Indicating the command LEN is processed.
LINE(...)	Indicating the command LINE is processed.
LOCATE(N1%,N2%)	Indicating the command LOCATE is processed.
LOCK	Indicating the command LOCK is processed.
LT? (N1%,N2%)	Indicating the decision "IF N1% < N2%" is processed.
MAIN_BATTERY	Indicating the command MAIN_BATTERY is processed.
MENU(Item$)	Indicating the command MENU is processed.
MID$(X$,N%[,M%])	Indicating the command MID$ is processed.
MOD(N1%,N2%)	Indicating a modulo operation is processed.
MOVE_TO(file%[,index%],record_number%)	Indicating the command MOVE_TO is processed. file% is the number of the DBF file; index% is the number of the IDX file; record_number% is the record number to move to.
MOVE_TO_NEXT(file%[,index%])	Indicating the command MOVE_TO_NEXT is processed.
MOVE_TO_PREVIOUS(file%[,index%])	Indicating the command MOVE_TO_PREVIOUS is processed.
MUL(N1%,N2%)	Indicating a multiplication is processed.

NEG (N1%)	Indicating a negation is processed.
NEQ? (N1%,N2%)	Indicating the decision "IF N1% <> N2%" is processed.
NCLOSE(N%)	Indicating the command NCLOSE is processed. N% is the connection number.
NOT	Indicating the logical operation NOT is processed.
NREAD$(N%)	Indicating the command NREAD$ is processed. N% is the connection number.
NWRITE(N%,A$)	Indicating the command NWRITE is processed.
OCT$(N%)	Indicating the command OCT$ is processed.
OFF_ALL	Indicating the command OFF ALL is processed.
OFF_COM(N%)	Indicating the command OFF COM is processed. N% is the number of the COM port.
OFF_ESC	Indicating the command OFF ESC is processed.
OFF_HOUR_SHARP	Indicating the command OFF HOUR_SHARP is processed.
OFF_KEY(number%)	Indicating the command OFF KEY is processed.
OFF_MINUTE_SHARP	Indicating the command OFF MINUTE_SHARP is processed.
OFF_READER(N%)	Indicating the command OFF READER is processed. N% is the number of the reader port.
OFF_TCPIP	Indicating the command OFF TCPIN is processed.
OFF_TIMER(N%)	Indicating the command OFF TIMER is processed. N% is the number of the timer.
OFF_TOUCHSCREEN	Indicating the command OFF TOUCHSCREEN is processed.
ON_COM(N1%,N2%)	Indicating the command ON COM GOSUB is called. N1% is the umber of the COM port; N2% is the line number of the subroutine to branch to.
ON_ESC(N%)	Indicating the command ON ESC GOSUB is called. N% is the line number of the subroutine to branch to.
ON_GOSUB(N%)	Indicating the command ON GOSUB is called. N% is the line number of the subroutine to branch to.
ON_GOTO(N%)	Indicating the command ON GOTO is called. N% is the line number of the subroutine to branch to.
ON_HOUR_SHARP(N%)	Indicating the command ON HOUR_SHARP GOSUB is called. N% is the line number of the subroutine to branch to.
ON_KEY(N%)	Indicating the command ON KEY GOSUB is called. N% is the line number of the subroutine to branch to.
ON_MINUTE_SHARP(N%)	Indicating the command ON MINUTE_SHARP GOSUB is called. N% is the line number of the subroutine to branch to.
ON_POWER_ON(N%)	Indicating the command ON POWER_ON GOSUB is called. N% is the line number of the subroutine to branch to.

ON_READER(N1%,N2%)	Indicating the command ON READER GOSUB is called. N1% is the number of the reader port; N2% is the line number of the subroutine to branch to.
ON_TCPIP(N%)	Indicating the command ON TCPIP GOSUB is called. N% is the line number of the subroutine to branch to.
ON_TIMER(N1%,N2%)	Indicating the command ON TIMER GOSUB is called.
ON_TOUCHSCREEN(N%)	Indicating the command ON TOUCHSCREEN GOSUB is called. N% is the line number of the subroutine to branch to.
OPEN_COM(N%)	Indicating the command OPEN_COM is processed. N% is the number of the COM port.
OR	Indicating the logical operation OR is processed.
POWER_ON(N%)	Indicating the command POWER_ON is processed. N% is the value of the setting.
PRINT(A$)	Indicating the command PRINT is processed.
PUT_PIXEL(...)	Indicating the command PUT_PIXEL is processed.
PUTKEY(N%)	Indicating the command PUTKEY is processed.
RAM_SIZE	Indicating the command RAM_SIZE is processed.
READ_COM$(N%)	Indicating the command READ_COM$ is processed. N% is the number of the COM port.
READER_CONFIG	Indicating the command READER_CONFIG is processed.
READER_SETTING(N1%,N2%)	Indicating the command READER_SETTING is processed. N1% is the setting number; N2% is the value of the setting.
RECORD_COUNT(file%)	Indicating the command RECORD_COUNT is processed.
RECTANGLE(...)	Indicating the command RECTANGLE is processed.
RESTART	Indicating the command RESTART is processed.
RETURN(N%)	Indicating the command RETURN is processed. N% is the line number to return, if it is not null.
RIGHT$(X$,N%)	Indicating the command RIGHT$ is processed.
ROM_SIZE	Indicating the command ROM_SIZE is processed.
SAVE_TRANSACTION(data$)	Indicating the command SAVE_TRANSACTION is processed.
SAVE_TRANSACTION_EX(file %,data$)	Indicating the command SAVE_TRANSACTION_EX is processed.
SEARCH_RF_CHANNEL(N%)	Indicating the command SEARCH_RF_CHANNEL is processed. N% is the assigned time interval.
SELECT_FONT(font%)	Indicating the command SELECT_FONT is processed.
SEND_WEDGE(DataString$)	Indicating the command SEND_WEDGE is processed.
SET_COM(...)	Indicating the command SET_COM is processed.
SET_COMM_TYPE(N%,type%)	Indicating the command SET_COMM_TYPE is processed.

SET_CURSOR(status%)	Indicating the command CURSOR is processed.
SET_LANGUAGE(N%)	Indicating the command SET_LANGUAGE is processed. N% is the setting of language.
SET_NET_PARAMETER(index%,A$)	Indicating the command SET_NET_PARAMETER is processed.
SET_PRECISION(N%)	Indicating the command SET_PRECISION is processed. N% is the numeric precision.
SET_RF_CHANNEL(N%)	Indicating the command SET_RF_CHANNEL is processed. N% is the channel.
SET_RF_ID(N%)	Indicating the command SET_RF_ID is processed. N% is the ID.
SET_RF_POWER(N%)	Indicating the command SET_RF_POWER is processed. N% is the power level.
SET_RF_TIMEOUT(N%)	Indicating the command SET_RF_TIMEOUT is processed. N% is the assigned time interval.
SET_RFID_KEY(...)	Indicating the command SET_RFID_KEY is processed.
SET_RFID_READ(...)	Indicating the command SET_RFID_READ is processed.
SET_RFID_WRITE(...)	Indicating the command SET_RFID_WRITE is processed.
SET_RTS(N1%,N2%)	Indicating the command SET_RTS is processed. N1% is the number of the COM port; N2% is the RTS status.
SET_SCREENITEMS(...)	Indicating the command SET_SCREENITEMS is processed.
SET_SIGNAREA(...)	Indicating the command SET_SIGNAREA is processed.
SET_VIDEO_MODE(mode%)	Indicating the command SET_VIDEO_MODE is processed.
SET_WEDGE(WedgeSetting$)	Indicating the command SET_WEDGE is processed.
SHOW_IMAGE(...)	Indicating the command SHOW_IMAGE is processed.
SIGN(N%)	Indicating the command SGN is processed.
SOCKET_CAN_SEND(...)	Indicating the command SOCKET_CAN_SEND is processed.
SOCKET_HAS_DATA(N%)	Indicating the command SOCKET_HAS_DATA is processed. N% is the connection number.
SOCKET_OPEN(N%)	Indicating the command SOCKET_OPEN is processed. N% is the connection number.
START TCPIP	Indicating the command START TCPIP is processed.
STOP_BEEP	Indicating the command STOP BEEP is processed.
STOP TCPIP	Indicating the command STOP TCPIP is processed.
STR$(N%)	Indicating the command STR$ is processed.
STRING$(...)	Indicating the command STRING$ is processed.
SUB(N1%,N2%)	Indicating a subtraction is processed.
SYSTEM_INFORMATION$(index%)	Indicating the command SYSTEM_INFORMATION$ is processed.

SYSTEM_PASSWORD(A$)	Indicating the command SYSTEM_PASSWORD is processed. A$ is the character string to be written as the password.
T(N%)	Indicating the stack's level. When the program branches to a subroutine, the stack's level increases 1; when the program returns, the stack's level decreases 1. It can be used to check if the "stack overflow" problem happens.
TCP_ERR_CODE	Indicating the command TCP_ERR_CODE is processed.
TCP_OPEN(...)	Indicating the command TCP_OPEN is processed.
TIME$	Indicating the system time is inquired.
TIME$(X$)	Indicating the system time is updated. X$ is the new system time.
TIMER	Indicating the command TIMER is processed.
TRANSACTION_COUNT	Indicating the command TRANSACTION_COUNT is processed.
TRANSACTION_COUNT_EX(file%)	Indicating the command TRANSACTION_COUNT_EX is processed.
TRIM_LEFT$(X$)	Indicating the command TRIM_LEFT$ is processed.
TRIM_RIGHT$(X$)	Indicating the command TRIM_RIGHT$ is processed.
UCASE$(X$)	Indicating the command UCASE$ is processed.
UNLOCK	Indicating the command UNLOCK is processed.
UPDATE_RECORD(...)	Indicating the command UPDATE_RECORD is processed.
UPDATE_TRANSACTION(N%,data$)	Indicating the command UPDATE_TRANSACTION is processed.
UPDATE_TRANSACTION_EX(...)	Indicating the command UPDATE_TRANSACTION_EX is processed.
VAL(X$)	Indicating the command VAL is processed.
VALF(X$)	Indicating the command VALR is processed.
VERSION(A$)	Indicating the command VERSION is processed. A$ is the character string to be written as the version information.
VIBRATOR(mode%)	Indicating the command VIBRATOR is processed.
WAIT(duration%)	Indicating the command WAIT is processed.
WAIT_HOURGLASS(...)	Indicating the command WAIT_HOURGLASS is processed.
WEDGE_READY	Indicating the command WEDGE_READY is processed.
WRITE_COM(N%,A$)	Indicating the command WRITE_COM is processed.
XOR	Indicating the logical operation XOR is processed.

APPENDIX VI

Cradle Commands

Through programming the terminal, you can use cradle commands to control the Cradle.

- To determine whether cradle commands are applied, use the third parameter of **SET_COM (N%, Baudrate%, Parity%, Data%, Handshake%)**.
- To determine which type of cradle to control, use the second parameter of **SET_COM (N%, Baudrate%, Parity%, Data%, Handshake%)**.

Parameters	**Values**	**Remarks**
#1 (N%)	1 or 2	Indicates which COM port is to be set.
#2 ***(Baudrate%)***	1: 115200 bps 3: 57600 bps 4: 38400 bps 5: 19200 bps 6: 9600 bps	◆ Unless you have changed the baud rate setting via the DIP switch onboard, assign 1 for Ethernet Cradle because its factory setting is 115200 bps. ◆ Unless you have changed the baud rate setting via the DIP switch onboard, assign 3 for Modem Cradle because its factory setting is 57600 bps.
#3 ***(Parity%)***	1: None 2: Odd 3: Even 4: Cradle commands	The parity setting is NOT applicable. Simply assign 4.
#4 ***(Data%)***	1: 7 data bits 2: 8 data bits	The data bits setting must be 8 bits. Assign 2.
#5 ***(Handshake%)***	1: None 2: CTS/RTS 3: XON/XOFF 4: Wedge Emulator	The handshake setting is NOT applicable. Simply assign 1.

Note: Baud rate will be reset to the DIP switch setting whenever you plug or unplug the RS-232 cable.

For example,

- Call **SET_COM_TYPE (1, 3)** to set COM1 to Serial IR communication.
- To enable the issuing of cradle commands to the Ethernet Cradle, call **SET_COM (1, 1, 4, 2, 1)**
- Call **OPEN_COM(1)** to initialize the connection over COM1.
- Issue a cradle command listed below. For example,

  `Sendbase$ = “#vErSiOn?”`
- Call **WRITE_COM(1, Sendbase$**)

  …

Select Modem (=Ethernet)

After issuing the command, the baud rate of the cradle will be reset to the DIP switch setting.

Cradle Command	Response
#mOdEm<CR>	#DONE<CR>

Note: For the Ethernet Cradle, the command "Select Modem" is actually means "Select Ethernet" because the modem board has been replaced by the Ethernet board.

Select RS-232

After issuing the command, the baud rate of the cradle will be reset to the DIP switch setting.

Cradle Command	Response	
#SeRiAl<CR>	#DONE<CR>	= OK
	#CABLE!<CR>	= No RS-232 cable detected!

Note: Baud rate will be reset to the DIP switch setting whenever you plug or unplug the RS-232 cable.

Get Version Information

You can retrieve the version of IR board.

Cradle Command	Response
#vErSiOn?<CR>	#Ver03.20<CR>

Note: There will be no response if the IR board version is no later than v3.00!

Unknown Command

Cradle Command	Response
(Unknown)	#NAK<CR>

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